



## MPHIL

### The Complexity Turn: Narrative, Science and Utility

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# **The Complexity Turn: Narrative, Science and Utility**

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**A thesis submitted for the degree of Master of Philosophy**

**University of Bath**

**School of Management**

**October 2011**

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# The Complexity Turn: Narrative, Science and Utility

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# The Complexity Turn: Narrative, Science and Utility

## *Abstract*

**Keywords:** complexity theory, learning history, narrative, tipping point, emergence, self-organisation, contingency, evolution, action research, worldview, post-modern science, ontology, realism, metaphor.

Complexity theory is a scientific perspective that illuminates the nature of the inter-connected, diverse, path-dependent, complex world and stands in contrast to traditional deterministic scientific perspectives. This thesis explores whether, and in what ways, complexity thinking is ‘useful’. Is it useful as a worldview; does it provide a useful description of experience and can it shape thinking as to how to engage with the world in ways that are sustainable and just?

Complexity theory is developed to include, more explicitly, the more subjective features of human existence – intention, values, the imaginal and the numinous. The tension between realist and post-modern perspectives is considered. This results in framing complexity as a post-modern science, with its emphasis on variation, emergence, contingency, narrative, inter-connectedness, the intrinsic unknowability of the future and the need for pluralist methods of inquiry. The idea that narrative approaches can be regarded as scientific for certain types of complex and evolutionary problems is considered, thus widening the traditional definition of science.

The research adopts action research methods, specifically a personalised narrative learning history, focusing in particular on inner processes of reflecting, theorising and reframing; and a process of co-inquiry. The co-inquiry work into the ‘usefulness’ of complexity thinking points to the dangers of reification of complexity concepts and their use, too loosely, as metaphor. The ‘usefulness’ of a ‘turn to complexity’: the usefulness of embracing complexity as a worldview, to stand in contrast to the mechanical Newtonian worldview, is recognised.

Complexity theory, with its focus on path-dependency and the importance of variation and particularity, provides an ontological framing for the epistemology implicit within action research. The action research methodologies adopted have allowed exploration of complex situations in direct and fresh ways, independent of any particular conceptual artefacts and independent of mathematical modelling.

### **Conclusions are:**

- Complexity is most useful when treated as a worldview: the detailed concepts can be ambiguous and misleading and distract from direct experience of the complex world.
- Complexity thinking can be expanded to include more than the ‘real’ and easily recognisable aspects of the world – emotions, meanings, intentions and the numinous.
- Complexity can be viewed most helpfully as a form of (non-relativist) post-modern science – but has other traditions which are realist, almost positivist; using complexity more loosely as a source of metaphor is another, less helpful, tradition.

- Theorising is a process that engages the emotions as much as the processes of cognition; it is often led by the imagination or triggered by chance events.
- People are attracted to worldviews which resonate with their psychological preferences and make them feel safe or understood. Reframing worldviews and beliefs affects identity and seems to be accompanied by a sense of loss.

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The link between the Diploma and the MPhil was catalysed by Gill Coleman's invitation to stand outside this theory of complexity that has entranced me for so long and I am very thankful for the way this led on to a whole new level of understanding.

The second phase of this work was supervised by Professor Peter Reason. I am indebted to him for the interest he showed in my burning questions, his ability to help me follow my own path and yet, with his insightfulness, reach further and wider.

There are two people who have been present throughout the whole of this journey: Genevieve Bartlett, a fellow traveller, and Margaret Gearty, who has acted as my critical muse on many occasions. Thank you to both of them.

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I want to acknowledge how lucky I have been, over the last thirteen years, to work with Professor Peter Allen. I hope I can do justice to all he has taught me.

And I would like to thank Professor Graham Room for his interest in my work in more recent times and for opening up some new possibilities to build on the work of this thesis.

Then there are my neglected friends who have supported me in many ways – in particular Brad Strachan, Jackie Cowling, Barbara Frost, Keith Smith, Keri Phillips, Sam Woolley, Ingrid Walton and Nick Walton, Neil Carpenter and Marion Liquorice. I'll be round for dinner soon, thanks!

Finally I would like to dedicate this thesis to my indomitable Mother, and to the memory of my Father, and most particularly to my Brother, who was tragically killed in a car crash in October 2004 and who is sadly missed.

# The Complexity Turn: Narrative, Science and Utility

## Chapter 1 Is complexity useful?

### *1.1 The starting point*

Complexity theory provides one way to engage people in a wider perspective as to how they see the world – a more holistic, participative, organic, empowering perspective. This thesis is written in part because I have been, for many years, deeply interested in and committed to the story that the ‘new science’ of complexity conveys and strongly motivated to share this story with others. Why is this? In part that is what this thesis explores.

Part of the motivation is illustrated by my visit to the Hay Literature Festival in 2009.

At the festival, I heard an LSE economist speaking about financial regulation. He likened the economy to a train on which we were passengers, where the engine was the US economy (but might be swapping to the Chinese economy), where regulations were the electrical controls and wires. This image conveys to the audience that (a) there is a thing out there that is an ‘economy’ and that it is somehow independent of them and beyond their influence; (b) the passengers are passive and in the hands of this thing ‘economy’; (c) the economy is taking them somewhere, presumably somewhere they want to go; (d) there is someone in charge who knows where they are going; (e) ‘they’, the train operators, may have mucked up the controls but it will just take a rewire, nothing serious, and then we will be on our way again; (f) they, the passengers, should not worry, all is going to be ok.

This mechanical – as opposed to complex – image of the economy conveys a lot of information to the audience before the speaker says anything else. He defines the context, the worldview<sup>1</sup>, in which to position what he has to say, but he does not lay that worldview open to challenge as it is subtly implied by this image. This is what I want to challenge. This subliminal image – of our world as a machine for us to ride on without a care in the world because someone else knows what they are doing – is very powerful and beguiling. This image is very far from a view of the economy as organism; an image of people interacting, where structures and forms emerge for a while and then may shift into something new; such an image conveys a sense of the economy as an ecology, *interwoven* with the environment, with politics, with issues of equality and justice and freedom, subject to evolutionary principles. In contrast, the train image does not invite – and indeed probably mitigates against – bringing us into a discussion about power or social justice or the planet.

This political concern underpins the work in this thesis, and has remained a core motivation. But the research has taken me more deeply into an inquiry as to why we become so interested in or captured by certain theories and worldviews and how we can help ourselves and others to see these beliefs and perspectives more objectively. And this begs the question as to why *I* have been so interested in complexity theory and the extent to which that is and has been generative or constraining.

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<sup>1</sup> Which is a mechanical worldview of certainty and control.

## 1.2 The back-story

### 1.2.1 Complexity, action research and ‘usefulness’

I first came across complexity theory in the mid 1990s and immediately was intrigued by it. It appealed to my scientific background, derived from undertaking a PhD in quantum field theory in the early 1980s; it also appealed to me as a way of understanding the complex social and natural world. By the late 1990s I was working part-time at Cranfield School of Management with Professor Peter Allen. Peter Allen worked with Ilya Prigogine<sup>2</sup> (1947) for many years and his work has been seminal in developing complexity theory for the social and ecological world. I took responsibility for the development of the teaching of complexity – to MBA students and on business courses.

I had been working with these ideas for many years when, in 2006, I started to engage with the Centre for Action Research in Professional Practice (CARPP) at the University of Bath. I first taught some sessions on complexity for the Masters in Responsible Business Practice and was pleasantly surprised how well-received were my sessions. I recognised though, that despite having an MBA and having taught for a few years in a business school, my knowledge of qualitative social research was limited. At Cranfield, I had not undertaken research myself: my focus had been on teaching. I decided to sign up for another research degree in May 2007 with CARPP, first with Professor Judi Marshall as supervisor and then, when she left Bath in early 2009, with Professor Peter Reason.

The focus of this research has developed over time. I knew I was going to look at some aspect of complexity theory but I was not, initially, sure what aspect. The idea finally crystallised, in a meeting with Peter Reason, into considering whether complexity was *useful*. This is, perhaps, an odd word to choose. The ‘usefulness’ of the word ‘useful’ is that it sidesteps the question as to whether complexity is an *accurate* representation of the social world. I did not have to argue about whether it was ‘true’ or appropriate. I was able to ask people how helpful they found the ideas – helpful in making sense of the world, helpful in making sense of their own experiences, helpful in choosing how to act. I consider the definition of ‘useful’ in more detail in section 1.3.3.

My overarching motivation was the sense that complexity theory, as an ontological framing, would be ‘useful’ in helping people to choose how to act in relation to issues of sustainability and social justice. The dominant doctrine is that deregulated markets are the most appropriate solution – with the only alternative being greater control and regulation: either laissez-faire or top-down control. Could complexity theory shed any light on this dilemma? I felt that it could, that taking a complexity worldview is a more helpful, appropriate and generative – and indeed *useful* – way of looking at the world than the more usual Newtonian scientific view that underpins most traditional methods in management, economics and environmental services. And more useful than its opposite, a blind trust in the markets<sup>3</sup>.

This is a strong assertion and this thesis sets out to question this assertion in a number of ways, as I outline in section 1.3.

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<sup>2</sup> Ilya Prigogine (1947) is regarded by many as the initiator of complexity theory through his work on non-equilibrium thermodynamics and dissipative systems.

<sup>3</sup> It is important to point out that laissez-faire approaches to economics and indeed to management are often conflated with complexity theory – a sort of belief that what emerges from self-organising processes must by definition be a good thing. I will explore this point in some detail in Chapter Seven.

### 1.2.2 My background as it is relevant to this work

My PhD in quantum physics (Boulton 1984) was based on developing what was regarded at the time as an enormous and complex mathematical model looking for – wait for it – ‘quantum transport effects in semi-conductors’. I learned a lot about mathematical modelling: how you test hypotheses with this method, how you distinguish between errors, how you work with the limitations of the method due to the necessity of finite boundaries and the necessity of discretising continuous functions, working in effect on a grid representation of time and space. Spending four years immersed in the ideas of quantum physics caused me to think in systemic, field-theory ways<sup>4</sup>, and to grapple with the paradoxes of quantum theory, for example the wave-particle duality. So it was scientific work, and yet it was work of the imagination – counterintuitive, in many ways, too.

Soon after I completed my thesis I changed career – first into technical consultancy, then, via an MBA, into management consultancy with a few forays into line management. So my focus transferred to human and organisational processes and into psychology. I trained in Gestalt psychology and became very interested in Jungian thinking and in Eastern philosophical traditions, particularly Daoism and Buddhism. I was interested in how people and organisations and indeed societies can change.

When I came across complexity theory in the mid-1990s, I saw this as a science theory much more relevant to the social and natural world than quantum mechanics or earlier classical theories. And my background in mathematics and physics meant I could follow the work of the complexity mathematical modellers and form a bridge into the world of management and economics. I was excited at the possibilities it offered and also excited at the ideas it contained.

I also became keen, after many years of working within business, to engage more actively with the social and environmental issues of such pressing importance. As a result of giving a talk about complexity, I met the Chief Executive of a charity based in East London, Social Action for Health. She and I recognised the resonance between complexity thinking and the ideas of community development. As a result, I eventually became, for five years, Chair of the organisation and was privileged to work with a passionate, committed, diverse, political group of people, engaged with some of the most marginalised communities in this country. It was wonderful. And the complexities of that work and those societies became very real to me.

I also became, more latterly, Chair of a company, Sustain Ltd, focusing on helping organisations to reduce carbon. Again I was plunged into complexity – how to change attitudes to climate change in our clients, how to develop strategy against such an uncertain environmental and political and economic background, how, internally, to maintain the strong collegiate culture and yet ensure long-term sustainability for the organisation as well as its clientele.

These differing aspects of my background can be seen underpinning the work of this thesis. The work in Chapter Three in particular is informed by my interest in psychology. And the connection between complexity and Eastern philosophy is a recurring theme too. I have a tendency to connect differing schools of scholarship rather than wanting to work within one tradition. I tend to take a broad and integrative approach rather than a narrow and deep one. And I am keen to connect theory to practice,

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<sup>4</sup> A field theory emphasises the non-local wave-like characteristics of the situation not the local particle-like nature.



to take my deepening understanding into how I engage in a practical way with some of the pressing issues of our time.

### ***1.3 The questions posed in this research***

#### **1.3.1 The questions posed and the chapters in this thesis**

The starting point for this research was to wonder why I, myself, am so committed to the theory of complexity, why I have spent so much of the last thirteen years exploring, teaching, consulting and writing about it. How is it that I have been so convinced about the importance of complexity theory? Do I understand my own motivations for being attracted to this theory? In what ways is it *useful* to *me*? Would a greater understanding of what drives my own beliefs and predilections help me to check out the nature of this motivation? And, by better understanding *myself*, would I gain insight into how to help others dis-identify from, and thus more easily examine, their deeply-held – and often unconsciously-held – beliefs? So the question – as to what intrigues me about complexity and why – is a key inquiry I explore in this thesis, in Chapter Three.

Secondly, if I am interested in complexity theory and in providing ways for others both to consider their own beliefs and to engage with complexity thinking, do I understand how people *work* with conceptual ideas and theories and worldviews? Indeed what *is* a theory, how are theories *developed*, how do they change our perspective? This exploration of the nature of theorising was informed by the work in Chapter Three where I followed my own theorising process over a two-year period and then I further developed these ideas in Chapter Four.

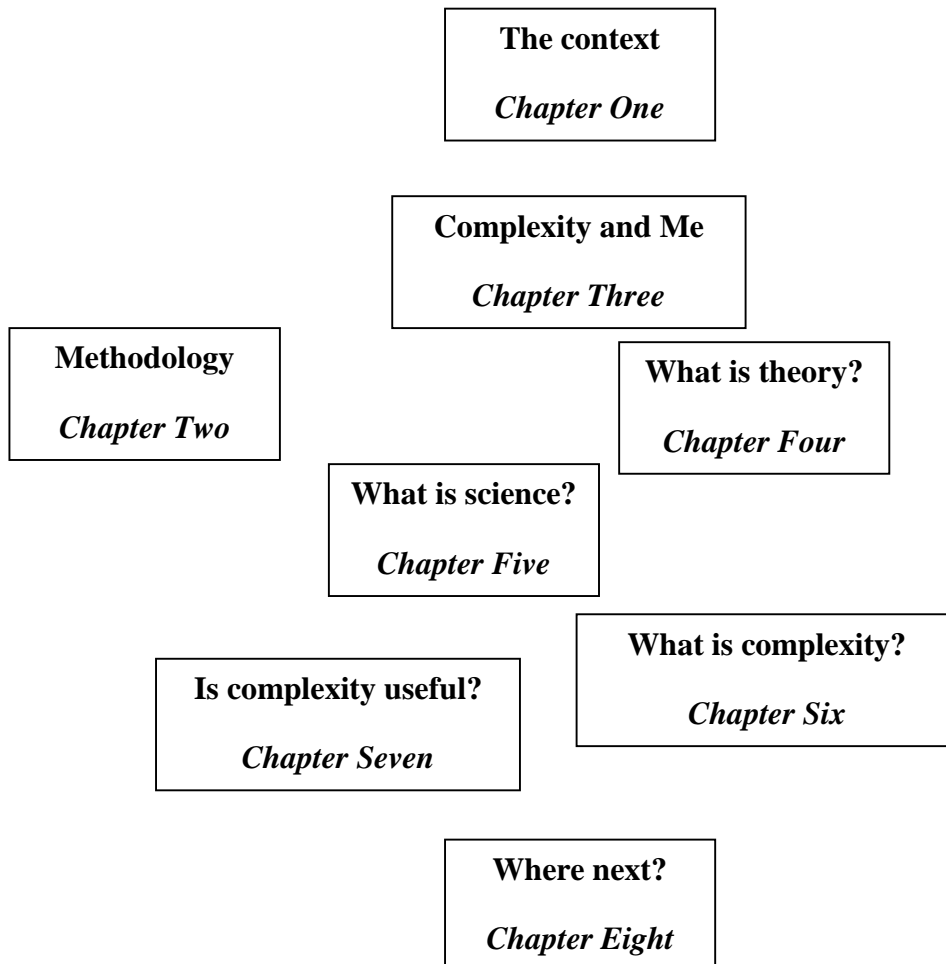
Thirdly, I became intrigued by the issue of the nature of science. Complexity theory is regarded, at least by some - and at least in some of its forms - as a science. But it is a very different sort of science from mainstream physics and indeed from mainstream natural science in general. What is science? Is science really as deterministic and unambiguous as is sometimes presented? And what sort of science is complexity? This inquiry forms the basis of Chapter Five.

Fourthly, as I interacted with a wide range of people interested in, or engaged in complexity, as I attended conferences and facilitated discussions and workshops on the topic, it came home to me just how many different complexity theories there are. And how difficult it is even to try and establish their basis, the set of assumptions that underpin them, implicitly if not explicitly. I was clear that the tradition that started with Prigogine - and this tradition emphasises, as does evolutionary theory, the central importance of fluctuations, diversity and particularity - was the basis of my own thinking. But there is in actuality a wide variety of mathematical approaches and these are based on varying assumptions. And as well as these mathematical approaches, many other people used complexity concepts more loosely, metaphorically. In Chapter Six, I describe and classify the breadth of complexity theories, and aim to show how they differ and what they share.

I then worked with a group of people, an inquiry group. The aim was to engage with complexity theory in some depth and really consider whether it *is* helpful, *useful*, whether complexity theory *does* seem appropriate and useful to understand human systems in the wider world. Does it hold up when subjected to such scrutiny? Is my passion for this subject justified? Does it lead anywhere? This is the focus of Chapter Seven.

Finally, in Chapter Eight, as well as drawing together the threads of this research, I look forwards and set out where my research interests are now heading and how I can take this learning back into my work in the world.

A summary of these stages is given below.



### 1.3.2 Emerging themes; the focus on the nature of theory

Although the main driving force, or central inquiry, for this thesis centres on complexity theory and its usefulness, there are underlying ontological themes that weave right through the work. These are ‘big’ ontological questions – as to the nature of theory and the nature of science and, finally, as to the nature of complexity theory itself. I found that as soon as I asked one question – is complexity useful – it begged another set of questions. What do I mean by ‘useful’? What is a theory anyway? What is science and why do we regard some things as science and not others?

These were questions of definition. But I was keen to explore these definitions, not only through exploring what people *said* about these terms but also through what people – myself and others – actually *do*. What is the *process* of theorising, of doing science? These explorations of process had a dual purpose. In part they allowed an exploration of the nature of theorising and the nature of science

through *practice*, through researching what I and others actually did. I did not want to rely on what *theories* said people did when theorising. In part, this exploration of the process of theorising informed how best to *work* with theories; how best to make complexity theory useful through skilful ways of challenging existing worldviews and skilful ways of bringing complexity theory alive as an alternative way of looking at things.

So this thesis in itself describes a journey, a developing and emerging inquiry, where one question led to another, or two others; where under one stone were others to be uncovered and under them even more stones. So *in itself* this thesis is an exploration of the nature of theorising and weaves between practical exploration – of my own processes or through discussion with others as in the complexity inquiry process described in Chapter Seven – and intense bouts of researching the literature. And then, particularly in Chapter Six, it led to a reframing and classification of the differing approaches to complexity thinking.

### 1.3.3 What do I mean by ‘useful’?

As I have said, I wanted to find a way of exploring complexity theory with people in an open-ended way and caught on to the idea of asking the question ‘is complexity useful?’ This sidesteps the question as to whether complexity theory is a ‘good’ or accurate representation of what happens in the world, even though that question is embedded in the word ‘useful’. It also sidesteps the issue of whether, and in what way, it is a science, whether it is a worldview or whether it is just a way of thinking. I was able to let such considerations emerge – or not – during the course of the work.

But what do I mean by ‘useful’? This idea of using a word such as ‘useful’ chimes to some extent with Mitroff and Kilman’s (1978) introduction of the test of ‘interesting’. It chimes in the sense that both words leave a lot of room for exploration, are colloquial, and sidestep issues of what is ‘accurate’ or ‘scientific’.

Mitroff and Kilman say (1978:63), for example, when discussing Kuhn (1962), that ‘nearly all of Kuhn’s contentions is wrong; for example there are nearly no, if any, clear-cut examples of scientific revolutions as he defines them, [that] the term paradigm is fraught with immeasurable difficulties. Yet Kuhn continues to be cited at an ever increasing rate. The reason is that Kuhn has produced a fascinating [interesting] theory of science.’

This is ‘interesting’ in that Kuhn’s idea of paradigm shift is, in the language of complexity, a tipping point<sup>5</sup> in the world of theory. A key underlying theme of this thesis is how we theorise and shift and modify our beliefs and worldviews. So is Kuhn’s theory of paradigm shift ‘useful’ even if, at least in the eyes of Mitroff and Kilman, it may be ‘untrue’?

How do you define ‘interesting’? Mitroff and Kilman quote Davis (1971) as having defined an ‘interesting’ theory as one which (1978:63) ‘(1) identifies previously taken-for-granted underlying assumptions of a particular social science, (2) exposes, perhaps for the first time, the assumptions for critical and public scrutiny, (3) argues that a set of counter assumptions is actually more plausible.’

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<sup>5</sup> I consider the meaning of tipping point in some detail in Chapters Six and Seven.

They say ‘An interesting proposition is one which attempts first to expose the ontological claim of its accredited counterpart as merely phenomenological pretence with its own claim to ontological priority. In brief, an interesting proposition is always the negation of an accepted one.’

This causes me to consider how I would define ‘useful’.

My current working definition is, first, that a theory is useful if it is able to shake up our belief system, make us reflect on our experience in a new way. So, in this respect, theories would have to be interesting, as defined by Mitroff and Kilman, in order to be useful.

Secondly, I would argue that for a theory to be ‘useful’, it has to be closer to describing our experience, more seemingly ‘true’ than other theories. It is not enough for it to be interesting. To give an example, Newton’s theories are most definitely interesting but they suggest the world is predictable and controllable when, in general terms, this is not the case.

Thirdly, I would argue that a theory is not ‘useful’ if it shapes our beliefs and behaviours in ways that lead to inequality and inappropriate ways to engage with the natural world. So when I use the word ‘useful’ I am taking an ethical position. I mean ‘useful to the continuing flourishing of the world’, not ‘useful to one group trying to dominate another’. Furthermore, useful theories would not only ‘rattle the cage’ of our beliefs, disturbing the way we reflected on experience, but would also change our behaviour, lead to different – and ideally more effective – action. So, a useful theory goes further than an interesting one in that it leads into action, and does not stop at reflection and re-framing.

## ***1.4 Link to action research***

Through my engagement with the CARPP, I started to recognise some of the links between action research and complexity thinking. First, action research gives a similar importance to particularity, to so-called micro-practice (Coleman and Gearty 2007). Complexity thinking and action research share this same viewpoint: that it is through following the *detail* that both understanding is gained and change can happen.

Secondly, action research, following Reason and Bradbury (2001), adopts a worldview which is almost identical to complexity thinking. For example, Reason and Bradbury (2001:7) say:

‘the emergent worldview has been described as systemic, holistic, relational, feminine<sup>6</sup>, experiential, but its defining characteristic is that it is participatory’.

This is a very similar ontological stance to complexity theory, which, as described in several places in this thesis, describes the world as emergent, systemic and path dependent.<sup>7</sup>

Thirdly, action research gives a practical and empirical approach to investigating the complex, interconnected and emergent world. It offers a methodology which is not based on modelling and yet which fits with a complexity ontology. It does not insist on an initial hypothesis for which to gain evidence, nor insist that the methods are defined in their entirety at the beginning. It allows for

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<sup>6</sup> It has to be said I have never seen the word ‘feminine’ used in complexity literature; in itself an interesting observation!

<sup>7</sup> And although this quote from Reason and Bradbury does not include the notion of path dependency, it is implied by the focus on micro-practice, the idea that it is in the detail, the particularity of the situation, where change happens and where we gain insight.

emergence, for surprise, for shifts in focus, through its emphasis on following the detailed path of what happens.

So action research gave a framing and an approach which was well-suited to exploring whether this science of complexity was indeed relevant and useful to the human and natural world. The *particular* approaches I adopted – based on a narrative, learning history and on co-inquiry – are described in Chapter Two.

Action research is pragmatic, emphasising the importance of action, that theories are no use of and in themselves. Marshall (2001) describes moving between the inner and outer arc of attention. She (Marshall 2001:336) speaks of the importance, in her own development, of the inner arc ‘seeking to notice myself perceiving, making meaning, framing issues’. She goes on to describe how she engages with the outer arc, which involves ‘reaching outside of myself in some way. This might mean actively questioning, raising issues with others or seeking ways to test out my developing ideas.... perhaps seeking to change something and learning about situation, self, issues and others in the process.’ Much of this thesis focuses on the inner arc of attention. I am interested in how I and others hold, reflect on, develop and shift theoretical stances.

Having said this, my purpose in exploring the inner arc of inquiry is action-oriented in several ways.

First, this work has given me a chance to review the way I engage with teaching and working with ideas of complexity – *what* do I teach and *how*.

Secondly, this work has allowed me to reflect on what I see as important; what is the focus of the research I want to do in the future, and how do I want to do it?

Thirdly, the work described in Chapter Seven, the co-inquiry into complexity, did allow me – as Marshall (2001:336) says – to ‘test out my developing ideas and change something’ about the way I worked with others.

Fourthly, as the theories and beliefs we hold shape our actions, then to surface and challenge worldviews and beliefs and to do this skilfully with others is likely to lead to changed behaviours and choices and actions. If a policy-maker comes to believe, for example, that ‘leaving things to the market’ is not only ineffective but likely to lead to increased inequality, he or she may choose different policies.

So whilst there is a skew in this research towards researching inner processes, it is not exclusive.

In Chapter Two I explore in more detail the methodologies I adopted and further consider the connection between action research and complexity thinking.

## ***1.5 What is complexity theory?***

The question as to what *is* complexity theory forms part of the substance of this research. I both categorise the many and different versions of complexity theory in Chapter Six and also extend my personal framing of complexity in the inquiry described in Chapter Three. In this current section I will define complexity theory following the work of Ilya Prigogine (1947). In my view, this work is both the earliest and the most comprehensive in that it looks at the relationship between emerging patterns

and the way variations and ‘events’ disturb current patterns.<sup>8</sup> In the next section I will summarise this perspective.

### 1.5.1 Complexity theory following Prigogine

Complexity theory evolved from a juxtaposition of ideas from physics and biology in the 1920s. Ilya Prigogine was and remains a central figure from this early period. He realised that physics had two key theories: Newtonian mechanics and thermodynamics. Each applies to different and specific types of problems. The problem comes with our desire to turn science into universal theories relevant to everything, including natural and human systems. Newton’s mechanics, if taken as a worldview, suggests that the world is a machine where everything, in principle, can be predicted; it offers the possibility of control due to that **predictability**. It also suggests **reductionism** – that a problem can be understood by separately studying its constituent elements; **reversibility** – that if we don’t like what is happening we can reverse it by reversing what we are doing; and **causality** – that we can identify clear cause-and-effect chains through our research.

In contrast, thermodynamics, as a worldview, suggests that the world is irreversible, that things decay and die. Prigogine’s question was: ‘how do these two theories relate to each other and why does each give such a different image of natural processes compared to each other and compared to evolution?’ Newton’s mechanics suggests everything goes on forever, unchanging; thermodynamics suggests everything dies; but evolution shows life develops into new and often more sophisticated forms.

The key to the answer to his question was beguilingly simple – classical physics looked at *closed* systems, as otherwise the maths was impossibly difficult. But most situations of interest are open; there is an exchange of information and energy and matter with the environment.

Here was born the science of complexity, which combined the Newtonian and thermodynamic perspectives and applied to open systems. It showed how open complex systems are evolutionary. Prigogine developed these ideas initially through work on chemical systems; later, through mathematical modelling, he started to investigate ecological problems and even later some of his team turned to social systems (Prigogine, Allen et al. 1977).

Prigogine’s view of a complex world is very in tune with evolutionary theory; but it adds another layer of understanding about the way systems evolve. His work was developed by Allen and others to consider the natural and social world. Prigogine’s complexity view presents the world as systemic and reflexive: where what happens next rests, in a complex and systemic fashion, on history, choice, context and chance. Change into new regimes can seem to happen suddenly and new qualities and patterns of relationships can emerge in ways that cannot be predicted. Prigogine’s complexity theory emphasises the importance of the *particularity* or uniqueness of the path of events; it places a sense of agency and value on individual actions and choices; it does not suggest chaos or randomness but nor does it suggest certainty. Rather, it suggests that patterns of relationships emerge which may sustain for a while but which are not set for ever. So, it relates to the Buddhist notion of emptiness; that is to

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<sup>8</sup> Some other approaches still cling to deterministic mathematics and so miss the importance of variation; the use of the so-called Master Equation by Prigogine (Prigogine et al 1977) and Haken (1977) works with variation by considering the range of what *can* happen, not just (as in statistical mechanics) what is *most likely* to happen.

say we and, more generally, our societies may have a particular form for a while but are in effect ephemeral, hollow, subject to change - not fixed or real<sup>9</sup>.

This view of the world changes our notion of agency. We cannot say the future is all mapped out, nor assume that those in control can make the necessary changes. We are a tiny part of the future and yet at the same time *our* actions might be the ones which start to affect existing patterns and norms. This view of the world also changes our view of issues such as climate change or management of the economy. Change can be runaway and irreversible; markets can collapse. We cannot approach climate change as if it were something that can easily be put right and reversed. We cannot assume markets rise or fall incrementally, nor that their future is predictable. And if we cannot control the world, then how should we lead, develop strategies, engage with economic thinking? To assume we can control and predict things when we cannot can be very destructive, as evidenced by current economic and ecological crises. So I would argue that this complexity worldview is a better representation of 'how things are' in the world than the traditional scientific mechanical worldview; equally, if we understood the world to be complex, we, as a society, might make better choices and engage with the world in a more sustainable fashion; hence the importance of these ideas as a way to engage politically.

### **1.5.2 The back-story; the antecedents to complexity theory**

In fact, the core of these ideas preceded Prigogine by several centuries. Early philosophers in both the East and West held a sophisticated view of the world as changing and flowing, yet with a degree of order and patterning that arose intrinsically, from within. For example, Heraclitus (Kirk and al 1957:195) captures this sense of patterning yet change in the following fragment:

'Upon those that step into the same rivers, different and again different waters flow...They scatter and ...gather...come together...and flow away...approach and depart.'

The Hindu Upanishads and the Dao de Jing present a similar sense of temporary patterning emerging – without the need for extrinsic design or planning.

However, Plato (Hare and Russell 1970:199) refused to believe that form or patterning could arise without external design and introduced the idea of a Creator who, guided by the notion of perfect forms that sit outside the universe, created a world that emulated and aspired to them. Uncertainty and fluctuations were seen as irritating limitations and something to be overcome; they were not seen to serve any useful purpose.

This theme of perfection and order then paved the way for the seizing of Newton's mechanics in the seventeenth century by French Enlightenment thinkers and for becoming *the* dominant worldview – where order, prediction and control are regarded as attainable and desirable and variations are viewed both as a nuisance and largely irrelevant. It is interesting to ask why a theory of physics that applied to certain limited problems of interaction between discrete objects was seized on as *the* dominant worldview. Newtonian thinking supports the notion of 'the grand design', and the view that logic will lead to the 'right' answer; indeed it implies there *is* a predictable 'right' way and 'right' answer. So it represents a way to control chaos, to be efficient, to overcome superstition, to make things happen in a predictable fashion – and this is all very beguiling.

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<sup>9</sup> In this argument I have skated over the fact that there is an issue in taking a theory from a physical realm to the social realm where people have intentions and make choices. I return to this issue in Chapter 7.

In contrast to this view of achievable perfection stands the messy and inefficient and surprising process of evolution. It was Darwin (1859) who first recognised that uncertainty is indeed *necessary* for change to happen, and that variation, uncertainty, messiness, diversity are *fundamental* requisites for both resilience and change. The notion of messiness as having a useful role – *fundamental* to innovation, adaptability and change – is very significant. We are still resistant to this perspective, as evidenced by the continued focus on prediction, design, control, measurement and an endless search for certainty.

The idea that variation is a pre-requisite for evolution and change to happen captured the imagination of philosophers, psychologists, sociologists and eventually physical scientists like Prigogine. For example, the Pragmatist philosopher Charles Peirce (1955:318) was one of the first to recognise the wider implications of evolution as a worldview. In 1891, he wrote:

‘Now the only possible way of accounting for the laws of nature and the uniformity in general is to suppose them results of evolution. This supposes them not to be absolute, not to be obeyed precisely. It makes an element of indeterminacy, spontaneity, or absolute chance in nature.’

And William James (1995:275), also part of the Pragmatist school, and regarded as the founder of psychology, explains in his lecture, ‘the Dilemmas of Determinism’, given in 1884:

‘Of two alternative futures which we conceive, both may now be really possible; and the one becomes impossible only at the very moment when the other excludes it by becoming real itself.... To that view, actualities seem to float in a wider sea of possibilities out of which they are chosen; and, *somewhere*, indeterminism says, such possibilities exist, and form a part of truth.’

So, the idea, recognised by Daoists and Buddhists and the Pre-Socratic philosophers, that the future is *of essence* unknowable, started to return to philosophical considerations following Darwin’s ‘Origin of Species’. Prigogine, in his autobiography, says his interest, as a young man, was fuelled by reading Henri Bergson’s (1911) ‘Creative Evolution’. His life work was driven by the question ‘why does life ascend the incline that matter descends?’ and from there, complexity theory was born.

### 1.5.3 Complexity theory in summary

The early philosophers noticed the world *was* uncertain but nevertheless had patterning or form; Darwin recognised that variation and uncertainty were in fact *central* to the emergence of new form; Prigogine (1947) took the next step. He and his colleagues started to explore *how* uncertainty led to emergence and evolution – and how the future is *in principle* unknowable. This was the beginning of the new science of complexity.

This work tells us that:

- ‘Things’ inter-relate, affect each other in a messy, complex, systemic fashion
- Variation and diversity are *necessary* for creativity, change, evolution, emergence
- The future builds on the past, but not with clear one-to-one correspondences and cause-effect relationships, but collectively; the future is created from a complex mix of influences including history, context, chance and choice. It is path-dependent, contingent on the detailed particularity of what happens.
- There is more than one possible future; the future cannot be reliably predicted from the past



- During times of change, radically new features and characteristics can emerge which could not have been predicted or even imagined prior to their emergence
- During times of stability, characteristics can get ‘locked in’ and be hard to shift. Change can have a non-linear, non-incremental quality – resistance to change, then seemingly sudden ‘tipping’ into new forms.
- Top-down design and control will certainly have an effect, but may not lead where intended
- Systems which are diverse, richly-connected and open to their environments can evolve form through the way connections are synergistic or antagonistic; such forms may be more harmoniously in tune with their surroundings than what was there before and hence may prosper; or they may be less tuned to the context, and hence may disappear. The future, in this way, emerges through self-organisation followed by natural selection.

## ***1.6 Linking the end to the beginning***

In this chapter, I have described the motivation for this thesis, and given an autobiographical background to the development of the work and the key questions it seeks to address. I have shown how the work is positioned within the context of action research and I have given a brief description of the theory of complexity, which is a significant focus for this thesis. I have outlined the structure of the thesis and the questions it explores.

Finally I want to comment on the title I have chosen for the thesis, chosen as I drew together my conclusions. I want to position the research approach I have taken and to make a comment on the emerging research themes that evolved during the course of this work.

### **1.6.1 The complexity turn: narrative, science and utility**

The starting point, as I describe at the beginning of this chapter, was to wonder if complexity is ‘useful’, hence the inclusion of ‘utility’ in the title. Utility implies usefulness, fitness for purpose and pragmatism.

As the work developed, as I will describe, it raised questions as to the nature of science. Out of this came the idea that to be scientific a method has to be fit for purpose, and if the situation to be explored is complex, detailed, contingent on the particularity of the situation, then it is not scientific to ignore this detail. So I started to play with the idea that narrative, at least for particular sorts of complex situations, (a) is an appropriate scientific method of exploration in that it allows for inclusion of detail and for new unexpected qualities to emerge; (b) gives a method of description, a way of capturing what happened; and (c) also gives the potential for transformation – as being aware of the detail, not glossing over the nuance and subtlety of what happens can in itself create change. So narrative exemplifies one of the key tenets of action research – that the research is both descriptive and potentially transformational. Exploration and change are not separate.

So this work has, for me, raised the importance of narrative methods and connected narrative to ideas about the nature of science in general and complexity science in particular. These two words – narrative and science - would not have been, and indeed were not included in the working title for this work – ‘is complexity useful’. These themes emerged during the course of the work and have become of central interest.

The phrase ‘the complexity turn’ was coined by Blaikie (2007) in his book on qualitative research methods. The phrase also encapsulates and symbolises a turn, more generally, in common discourse.

There is increasingly more general recognition that the world is complex; we cannot control the global economy; we do not know how to respond to climate change. The world seems increasingly unstable both at the level of economics (a very unstable stock market), social unrest (UK riots and Arab Spring), and environmental extremes (tsunamis, hurricanes, major shifts in ecological balances). So thinking of the world as complex seems increasingly acceptable, relevant and 'useful'. Indeed this 'turn' feels exciting; perhaps we might finally start to get to grips with such concerns as these?

### **1.6.2 Placing my approach in context**

Finally I want to comment on how I have approached this thesis. I cover a very wide range of issues – the nature of science, the nature of theory, critiques on realism and post-modernism, research methods, ancient cosmologies, ethics, theory of mind and theories of change. I have felt, in undertaking this work, that there is always another literature to uncover, another set of ideas in another discipline, that is relevant. But the core of my approach has been to work pragmatically and empirically, shaping the frame of my research around explorations of actual situations – my own explorations of my own journeys with theory described in Chapter Three and section 5.4 and the discussions about complexity undertaken with an inquiry group described in Chapter Seven.

So this thesis is primarily a piece of action research, seeking to explore and develop complexity theory. Its contribution is (a) to show how narrative methods allow for the exploration of the 'inner arc of inquiry', allow for a detailed exploration of the process of theorising; (b) to show how complexity science - and indeed science generally - can be widened in its remit to include the complex world more holistically and (c) to show how complexity thinking and action research can be happy bedfellows, with complexity thinking articulating an ontology which frames an action research epistemology.

### **1.6.3 Emerging themes**

One of the outcomes of this research has been the inquiries and interests that have emerged during the course of the work. As well as an increasing respect for narrative methods and a deepening recognition of the social construction of science, there are three other themes in particular that have emerged as a result of this work:

- The first is an increased recognition of the power of worldviews and beliefs to shape behaviour and hence the importance, in facilitating social change, of finding and refining ways to surface and challenge conceptual framings and sometimes-unconsciously-held beliefs.
- The second is the lack of attention paid in the world of complexity science to methods of investigation and ways of knowing other than mathematical modelling. There is a need for a more pluralist, inclusive and time-sensitive approach to researching the complex world; based on deep and contexted and systemic engagement with real-life, dynamic emergent issues.
- The third is the inclusion of the human qualities – of intentions, values, the imagination, instincts, inter-dependency – into considerations of complexity; and indeed the need to recognise, in complexity thinking, the wider unknowable qualities of the world in general.

These three themes emerge throughout the course of this work. I comment on them at several points in the thesis and draw together the threads in Chapter Eight. They are the themes I take forwards as a result of this thesis; they shape the agenda for future research.

## Chapter 2 Methodology

### *2.1 An overview of the methods adopted in the work for this thesis*

'The outcome of any serious research can only be to make two questions grow where only one grew before.'

**Thorstein Veblen**

I start with Veblen's quote for three reasons: in part as it is in tune with complexity theory, the idea of the future opening up with possibilities; in part as Veblen is rather a hero in my mind. He wrote, in 1898 (Veblen), 'Why is economics not an evolutionary science' in which he presents all the arguments against classical economics and in support of the idea of an evolving world in the most wonderful – and sometimes wonderfully scathing – prose. And in part, I start with this quote as it sums up how I have felt many times during this thesis; I make some headway and then two questions arise where there had been only one and I go through another struggle for clarity and perspective.

Before I look in detail at the methods I use, I want to give a brief overview of the approach I have taken.

In Chapter Three, 'Complexity and Me', I present a personal learning history of how I questioned my relationship with complexity theory, and ultimately reframed how I understood the theory. My intention was to follow my thinking process over an extended period and see what I could discover about it. I used a similar method over a shorter period in section 5.4. In section 5.4 I tell the story of how I came to connect narrative with science and came to consider that complexity theory – at least some approaches to it – is a post-modern science.<sup>10</sup> Section 5.4 follows more of a story-line, is more temporally coherent than the work in Chapter Three, in which the presentation of my process of exploration and development is more fragmented, in part as it took place over two years rather than a few months.

The other key action research methodology I use, in the work described in Chapter Seven, is a co-inquiry process. This was with a group considering the questions of whether, and in what ways, and under what circumstances, complexity is useful.

The remaining chapters – four, five and six – tackle overarching ontological questions: what is theory (Chapter Four): what is science (Chapter Five): and what are the research paradigms within the umbrella of complexity theory (Chapter Six). This is potentially a vast undertaking as for each topic there is a huge literature. My primary motivation in exploring the nature of theory is because theorising is often presented as a rational, linear, rather Newtonian process and research methodologies often promote, and suggest we adopt such a linear approach. But is theorising really rational and linear? Does this accord with my own and others' experience of theorising and undertaking research? Is it not more complex than that?

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<sup>10</sup> I define 'post-modern science' in section 5.4.

Also, in order to explore what complexity theory is, and how to develop a complexity research methodology<sup>11</sup>, I need to understand what theory and science are, before I can position complexity theory on this ontological stage.

In these chapters (four to six), I research the literature, paying particular attention to comments on practice as well as to theoretical framings. In Chapter Six in particular, I develop a new classification of approaches to, or schools of, complexity. What method do I use to develop this classification? I work through trial and error, through looking for patterns: looking for self-consistent ways to surface and articulate and group certain features of differing approaches to complexity – in relation to their ontology, epistemology and methodology.

In the following sections I want to look at these three approaches – a personal learning history (section 2.4), a co-inquiry (section 2.5) and an approach to exploring ‘big’ ontological questions (section 2.6) - in some more detail.

The process of my research has been influenced by and is situated within the broad school of action research and I want to start, in section 2.2, by considering in what ways my work is action research. I then consider, in section 2.3, the similarities and differences between action research and complexity theory.

## ***2.2 In what ways is my work action research?***

Action research (Reason and Bradbury 2001:xxii) demonstrates ‘an inquiry-in-action that positively shapes... lives’. They say that action research<sup>12</sup>:

1. Responds to practical and pressing issues in the lives of people in organisations and communities
2. Engages with people in collaborative relationships
3. Draws on many ways of knowing
4. Is strongly values-oriented, seeking to address issues of significance concerning the flourishing of human persons, their communities and the wider ecology in which we participate
5. Is a living emergent process which cannot be pre-determined but changes and develops as those engaged deepen their understanding of the issues to be addressed

How does the research I describe in this thesis fit with this definition of action research?

### ***Points 4 and 1 Values and ‘pressing issues’***

In terms of ‘values-orientation’ (point 4) and ‘pressing issues’ (point 1) my overall motivation is to find ways to expose and challenge the still-prevailing mechanical worldview, as I have discussed in Chapter One. So my motivation is a political one, driven by a sense of the pressing issues of social inequality and climate change. The focus on the work described in this thesis, whilst in service of that motivation, focuses on complexity theory: what is it, what does it mean for me, how is it useful? Is it useful as a contrasting worldview, one that emphasises interconnections and emergence, resonant with the way Reason and Bradbury emphasise those qualities?

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<sup>11</sup> The idea of developing more explicitly a non-mathematical-modelling social research methodology based on complexity principles emerged during the course of this work, as I explore in section 8.8.

<sup>12</sup> Slightly shortened from the original.

### ***Point 3 Ways of knowing***

The issue of ‘ways of knowing’ (point 3) is a key one to discuss. I am primarily interested in how we come to ‘know’ about theories, how we develop concepts and worldviews. I am focusing on the ‘action of thinking’ rather than the ‘action of doing’. So this inquiry may seem, at first glance, at odds with action research. Reason and Bradbury (2001:xxv) say ‘traditionally science has privileged knowing through *thinking* over knowing through *doing*’. And (2001:xxiv) there is ‘a different relative emphasis on the importance of action and its relationship to conceptual insight’ than in traditional qualitative research.

The subtle point I want to make is that my interest is in the ‘action of thinking’. I am not separating ‘knowing through thinking’ from ‘knowing through action’ but trying to ‘know about’ the ‘action of thinking’. I am trying to explore the details of the processes, the ‘acts’ that lead to the development of ideas and worldviews. It is true that these ‘acts’, the processes of developing ideas and beliefs to which I pay attention privilege the inner arc of inquiry (Marshall 2001:335), as I discussed in section 1.4.

I am focusing in a detailed way on how new thinking emerges. I am focusing on the processes, predominantly but not exclusively ‘inner’, of conceptualising, reading, feeling, dialoguing, imagining, telling stories, reflecting and conceptualising again. I am seeking to explore the *ways* we develop thinking – and to compare this with the traditional ways science and definitions of research methodologies and other traditions say we think.

This process is interspersed with forays into the outer world for inspiration, challenge and experience. I test beliefs and ideas by discussing with others, or by carrying the ideas around over a period of time and reflecting on how they hold up when measured against experience. And, in my work with groups focused on helping them to explore worldviews<sup>13</sup>, I continually test out new methods as I learn more about what works both through my own inner explorations and by their feedback.

And, although my exploration is more ‘inner’ than ‘outer’, the *motivation* for doing this is to lead to refined action in the ways I engage with others around theory, as I have already discussed in section 1.4.

So I would argue that this inquiry into thinking is a legitimate focus of inquiry for action research and is a contribution to the research of the action research community.

### ***Point 5 A living emergent process***

Then there is the statement (point 5) that action research is a ‘living emergent process which cannot be pre-determined’. As I have described in Chapter One, this statement is very much in tune with, and a part of, complexity theory. The focus is on trying to follow the living emergent way my thinking develops using methods which themselves are living and emergent; methods which do not seek to respond to a pre-established hypothesis, nor try, at the beginning, to limit scope. This open-endedness illustrates one of the ways the work for this thesis follows the tenets of action research.<sup>14</sup>

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<sup>13</sup> Which I discuss in section 4.5.2 and 8.6.

<sup>14</sup> The issue about hypotheses is a tricky one. Some researchers who use action research in the field will indeed start with hypotheses (e.g. Bevan’s work in Ethiopia, which I discuss in Annex 8.2, starts with the hypothesis that the local context for communities is as important as the effect of government policy). But, as Bevan et al

## ***Point 2 Collaboration***

Finally, there is the issue of collaboration (point 2). Two of the examples of focused research I give in this thesis (inquiry into ‘complexity and me’ in Chapter Three, and inquiry into the link between complexity and narrative in section 5.4) were examples of first-person action research<sup>15</sup> (although, once again, the focus is on the inner processes rather than a reflection on the affects of action in the outside world). I did, however, invite input and comment from others in this work, so these inquiries had a degree of participation, if not collaboration. So I do explore the developmental impact of engaging with others through dialogue and feedback and indeed many of the steps forward I describe in the inquiry into ‘complexity and me’ were triggered by comments and feedback from others.

Then the inquiry described in Chapter Seven was co-inquiring, and I unpick the ways in which it was collaborative in section 2.5.

Finally, I can argue that the whole inquiry of this thesis focuses on a relationship, albeit my relationship with a theory; not exactly a collaboration (with a theory) but certainly co-evolving!

## ***Summary***

So I would argue that the work of this thesis satisfies the tenets of an action research methodology despite preferencing explorations of the inner arc of inquiry.

## ***2.3 Complexity and action research; ontology and methodology***

As discussed, this thesis is an exploration of complexity theory, working within an action research paradigm and using, primarily, action research methods. It is therefore important to consider the similarities and differences between complexity thinking and action research.

With regard to complexity theory, one of the distinctions I develop in this thesis is the difference between complexity ideas as ontology and complexity as methodology. I want to look at the similarities and differences between action research and complexity thinking against this same frame.

### ***The ontology of action research and complexity***

With respect to action research, Reason and Bradbury in particular are careful to express their ontological position, the worldview which underpins their approach to action research. As I discussed in section 1.4 they describe this worldview as systemic and participatory and go on to describe (Reason and Bradbury 2001:12) ‘the nature of the given cosmos ... as radically interconnected and evolutionary’.

How do these statements compare with the implicit ontology of complexity theory? The ontology of complexity, following Prigogine and Allen (1977) sees the world as systemic, emergent, and path dependent. That is to say, it is an evolutionary perspective that emphasises the generative importance of both detail and historicity.

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(2011) indeed discuss, such hypotheses must be carefully ‘held’ so they do not close down what you see or for what you look.

<sup>15</sup> First-person action research (Reason and Bradbury 2001:xxv) ‘address[es] the ability of the researcher to foster an inquiring approach to his or her life, to act awarely and choicefully, and to assess effects in the outside world while acting’.

Reason and Bradbury (2001:xxvii) further say that ‘social and organisational realities may be understood to be outcomes of patterns of interaction between the members; in turn the members’ dispositions and practices are shaped by social and organisational procedures.’ This description – of the emergence of patterns of relationships and the way such patterns evolve reflexively with the institutional practices they both shape and are shaped by – is entirely consistent, I would say, with a complexity perspective, which would describe such processes as co-evolving, self-organising patterns.

Another connection is with the idea of universality. Reason and Bradbury say (2001:7):

‘if we approach our inquiry with appropriate critical skills and discipline, our account might provide some perspective on what is *universal*, and on the knowledge-creating process which frames this account’.

This use of the concept of universal is of great interest in thinking about what kind of science<sup>16</sup> is complexity. What does universal mean in a contingent and path-dependent and complex world? If complexity is a science and science deals with ideas of universality, do we need a new understanding of ‘universal’? It may, for example, be universally true that nothing is universal!<sup>17</sup>

So ontologically, I would say that there is a great resonance between Reason and Bradbury’s action research and Prigogine’s complexity theory.<sup>1819</sup>

### ***The methodology of action research and complexity***

When it comes to theories of knowing and types of methodologies, however, complexity theory and action research have taken different paths. Most complexity theorists are mathematical modellers and, in much of the literature on the subject, many do not distinguish between the complexity of the model they use and the complexity of the ‘real world’. So complexity theory makes various assertions about the ‘real world’ which, quite often, are not sought for in the ‘real world’ but merely in modelled representations of that world.<sup>2021</sup>

So I became interested in whether an action research approach could shed some light on whether complexity theory makes sense of the world and is ‘useful’ when we think about or engage with the world of our experience. This was my first question. But, more than that, is action research a research paradigm, a methodological stance, that fits with a complexity ontology? Do action research methodologies provide – or at least contribute to – a complexity-framed social research methodology?

In summary, I am interested in whether (a) complexity theory provides another sort of justification for Reason and Bradbury’s assertions about the cosmos, about their ontological stance, (b) whether action research methodologies can ‘check out’ whether and in what ways complexity thinking is ‘useful’,

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<sup>16</sup> I return in some detail to the question of what is complexity – and what is science – in Chapters Five and Six.

<sup>17</sup> Resonant with the well-known philosophical twister that ‘all Cretans say they are liars’!

<sup>18</sup> In the tradition of Prigogine and Allen at least; not all complexity theory is evolutionary, as I discuss in Chapter Six.

<sup>19</sup> It is also the case that complexity theory in general does not take an axiological stance. Most complexity theorists would see a complexity perspective as value-neutral. For example, complexity theorists would approach the idea of self-organisation, the process of emerging patterns in relationships, as a phenomenon to be explored and understood, rather than focusing on its potential for social change. Allen is an exception to this as exemplified in his 2007 paper with Varga.

<sup>20</sup> I explore this in some detail in Chapter Six.

<sup>21</sup> There are some exceptions to this, for example Bevan et al (2011) as I explore in Annex 8.2.



whether complexity ideas do indeed translate and apply to human situations and (c) whether action research methodologies might form the basis for – or a contribution to – the development of a complexity-framed social research methodology.

## ***2.4 The development of a narrative method for inquiring into the process of theorising***

### **2.4.1 Considering narrative**

I wanted to find an approach that would allow me to research my own theorising, that would allow me to capture and to reflect on how I came to acknowledge and develop and change and challenge certain theoretical ideas I held. A method which did not overly constrain to what I gave attention and prominence; and a method which did not require an initial hypothesis or narrowing-down as to the anticipated process my theorising might follow or the effect the research might have on me.

So this research process would give room for, and not constrain, the emergence of something new, would allow for the unexpected and would enable the following of the process of emergence if it and as it happened. The research process would pay attention to the systemic nature of the situation and would not require too narrow a path of inquiry but allow the taking of detours; it would facilitate the paying of attention to contextual features or to new entrants into the situation. It would recognise the importance of the detail – the particularity, the granularity of the conditions and events and the particularity of the order in which things occurred, the *sequence* of events. So the research would need to take place over time, rather than take a snapshot or conflate events or ideas that happened at different points in the story. It would be free of the need to assume the existence of unambiguous cause-and-effect chains.<sup>22</sup> And it would be free of the need for initial hypotheses to shape the approach.<sup>23</sup>

A narrative approach would seem to fit these requirements and there were two key influences that led me in this direction; one was reading Gillian Beer's (1983) account of the way Darwin researched and wrote about the 'Origin of Species'. The second was reading Margaret Gearty's (2009) description of the use of a learning history approach in her own research. I will consider these influences in the next sections.

First it is helpful to consider what indeed *is* a narrative approach? On one level, the definition is straightforward; it suggests working with stories. But there are several different approaches and motivations within this broad category<sup>24</sup>. Stories can be used to explain and critique an idea; they can be explanatory. For example, I give instances in Chapter Seven of where, in giving a talk about complexity, I told carefully-chosen and sometimes tidied-up stories to elucidate a theoretic perspective and then others critiqued the theory by measuring it against stories from their own life and experience.

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<sup>22</sup> As Hume (discussed by Isaiah Berlin (2000:32) in 'The Roots of Romanticism'), pointed out, the best we can say is that 'this situation follows that situation' or 'normally [...] this thing is to be found before or at the same time or after that thing'.

<sup>23</sup> The danger, in looking for evidence of a hypothesis, is that you select on what to focus, what to deem important and make assumptions as to how that is going to be revealed.

<sup>24</sup> 'Narrative approaches' and 'narrative inquiry' are huge topics with huge literatures and I am aware I only touch on these here.

Stories people tell in organisations or ‘in the field’ can indicate what people see as important, how they have made sense of events, what is the prevailing discourse and culture. Some qualitative researchers focus on collecting and analysing such collections of stories. Some researchers feel that such stories need to be ‘complete’, to have a sort of integrity, a beginning, middle and end. Other researchers collect fragments of narrative, capture fragments of conversation and would argue (for example, Georgakopoulou (2010)) that insisting on more complete stories prejudices the selection of accounts – preferences the stories of the more articulate, or preferences older, more well-established accounts which have been tidied up and embellished. Fragments of narrative, Georgakopoulou argues, are more immediate, more authentic and are less prone to bias in selection.

Some narrative approaches to research concentrate on trying to *describe* what happens; the output is an attempt at a faithful representation of events. Other narrative approaches seek ‘narrative continuity’ and ‘narrative unity’ (MacIntyre 1981), a way (Clandinin and Connelly 2000:3) to ‘think in a more detailed and informative way about the general construct of continuity in individual’s lives’.

Others focus on a reflective overview of their life. Clandinin and Connelly (2000:8), for example, describe the autobiographical writings of Mary Catherine Bateson (1994) in *Peripheral Visions* which, they say, focused on understanding how one understands a changing world.

So, what is my position in relation to these options? I wanted narrative continuity in the sense that I wanted to follow the story over time, and hence allow a search for a pattern, a journey, a meaning; I wanted a way to *reflect* not just to *describe* and I wanted an autobiographical method. But I did not want to hold an expectation or constraint that the account *must* read like a ‘story’, with a clear plot, or that I would *necessarily* discern a narrative continuity, or, indeed, discover anything of value.

## 2.4.2 Narrative approaches, complexity and evolution

Given my focus in this thesis is on complexity, it is interesting to consider the link between the method (narrative) and the theory (complexity). The linking of narrative and evolutionary/complexity perspectives has been considered by a small number of authors ((Snowden 2002), (Luhman and Boje 2001), Byrne<sup>25</sup>), but I would say most notably – or at least most notably for me – by Gillian Beer (1983), in her book ‘Darwin’s Plots’<sup>26</sup>. Beer wrote about the way Darwin *wrote* the ‘Origin’ – as a tentative and time-sequenced story of how he came to the still-tentative conclusion that evolution had at its heart the principles of variation and selection. She said (1983:49):

‘Darwin’s language does not close itself off authoritatively nor describe its own circumference...He sought to move out beyond the false security of authority or even of the assumption that full knowledge may be reached. The nature of the argument led into expansion, transformation and redundancy of information. The Darwinian world is always capable of further description and such description generates fresh narrative and fresh metaphors which may supplant the initiating account.’

(1983:6) ‘Evolutionary theory is first a form of imaginative history. It cannot be experimentally demonstrated sufficiently in any present moment. So it is closer to narrative than to drama.’

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<sup>25</sup> Byrne, in a recent (Feb 2011) book proposal on complexity and social science says ‘It will argue for a concentration on narratives since what is of interest to us is all of the past history, current condition and future potential of complex systems and any description of these has to be understood in narrative terms’.

<sup>26</sup> This book explores how Darwin’s theories influenced late nineteenth-century literature.

(1983:6) 'Evolutionary ideas shifted in very diverse ways the patterns through which we apprehend experience and hence the patterns through which we condense experience in the telling of it.'

(1983:65) 'Darwin's work is the description of a process of becoming, and such a process does not move constantly in one direction.'

I found this account – of how Darwin worked and wrote and how that mirrors the process of evolution about which he wrote – quite thrilling. Finding this writing was a key 'aha' moment for me. Beer talks about Darwin's narrative as open, 'does not close itself off authoritatively', is 'capable of further description'. She talks about 'redundancy of information', important because we do not know what may trigger a change or what may link reflexively to another factor. She says that evolution 'cannot be demonstrated sufficiently in any one present moment'.<sup>27</sup> She talks about 'a process of becoming', a phrase much used by Prigogine (1980).

Beer makes the link between the method of *apprehending* patterns, the process of *telling* about it and the evolutionary process itself. Clandinin and Connelly (2000:17), in their book 'Narrative Inquiry', make a similar point:

'If we understand the world narratively, as we do, then it makes sense to study the world narratively. For us, life...is filled with narrative fragments, enacted in storied moments of time and space'.

So, I felt, if narrative was good enough for Darwin, it was good enough for me. And its connection with the path-dependency central to complexity thinking strengthened my resolve.

### **2.4.3 Personal learning history as methodology for emergent, contingent problems**

At around the same time as I was reading Darwin's 'Plots' (early 2009), I came across learning histories through the work of Margaret Gearty (2009). Margaret undertook a learning history of a change process in the London Borough of Merton, in 2006. What particularly struck me in this history was a story she narrated as to how a critical connection that materially affected the change programme came about as a result of a chance encounter between two people in a vet's waiting room. The capturing of this 'particularity' and seeing that this was a critical factor in the success of a change programme – so both *noticing* the particular quirky event and *following* the story long enough to see its impact – caught my attention. It caused me to think that a similar process might be relevant for looking at the process of theorising.

Roth and Bradbury (2008) define a learning history as a shared narrative which reflects on both the actual history of events and the learning from them. The intent is for those involved to reflect and learn together – and for others to engage with the whole, sometimes messy narrative as a way of learning from the experience. So, whilst a narrative, as I have discussed in the previous section, can be used to illustrate a point or describe a story which moves towards a clear ending, a learning history

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<sup>27</sup> This same point is made by Allen (Allen and Boulton 2011:172). 'And how can we decide whether the variations occurring at any given moment are simply fluctuations within the stationary probability distribution or instead reveal a changing distribution? For example, in considering climate change it is very difficult to tell whether some 'freak weather' event is simply an extreme event within the pre-existing distribution or is in fact an indicator of a change in the distribution.'

attempts to stay close to what happened – with limited interpretation (or at least, where there is interpretation, it is tentative, suggestive) and limited intentional selection. Yet it still allows for my requirement (discussed in section 2.4.1) of ‘narrative continuity’, allows for the emergence of patterns and of meaning.

So could I develop this learning history approach to explore the process of theorising, to follow the process of how I go about thinking about and developing theories? I wanted to get away from the risk of presenting a tidied-up version of how I *should* theorise, or how the theory says theorising is done – or indeed even how I *think* I theorise. Can I capture what I actually do? Can I take away the propensity to search for an heroic rational, ‘sensible’, acceptable, ‘professional’ process and allow the messiness of the ‘what actually happens’<sup>28</sup> to be revealed?

Although I do not, in Chapter Three, primarily develop a learning history in a shared way, I am, in a sense, weaving a shared history with myself<sup>29</sup>, by moving back into what I have written previously as well as journaling in the moment or soon after something happened as well as taking up the threads of the inquiry at a later date. This weaving of a history comes from reflecting on my reflections and thoughts and feelings at later times. This is exemplified by the approach to the inquiry described in Chapter Three, ‘Complexity and Me’, which took place over a period of two years and seeks to follow the way in which I explored my relationship with complexity theory. I moved backwards and forwards through time, made links, noticed, later, things in my writing I had not noticed at the time, gave it to others to read who made comments back which triggered further insights; finally, I drew together a meta-narrative, a perspective on the whole story, and developed a suggested ‘process of theorising’ which might have more general usefulness, to me and to others.

What might be the limitation of such an approach? How does it compare with James’ (1912) notion of radical empiricism? As Walton (2008) explains, James’ view was that nothing should be included which is not directly experienced, nor anything excluded which is directly experienced. My approach is not as pure as this; I *do* include reflections on what I experience and sometimes *do* choose to omit some material in order to contain the inquiry to some degree<sup>30</sup>. But this ideal – of trying to tell the account of what I did and what I thought and felt *as it was*, as it unfolded and not seeking to leave anything out or make ex-ante decisions as to what is of value – underpins this research.

So, having thought about narratives, having reflected on Beer’s words on Darwin, having been attracted by Gearty’s work on learning histories, I decided to use a form of personal learning history in my first-person explorations of my own theorising processes.

## 2.5 Co-inquiry

### 2.5.1 Introduction

I have described my approach to first-person inquiry in the previous section. Another key part of the research described in this thesis was based on a co-inquiry process into the usefulness of complexity,

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<sup>28</sup> And of course even this cannot be what *actually* happened, as what I reported was dependent on what I paid attention to at the time; others watching me may have had a different view, a different interpretation of what I was doing.

<sup>29</sup> There is in fact a whole literature of auto-ethnography (a form of autobiographical personal narrative that explores the writer’s experience of life) which I did not explore (for example, Chang, 2008).

<sup>30</sup> If I included more than fragments of my journaling and historical writing, I felt I would run the risk of swamping the reader.

described in Chapter Seven. In this section, I want to describe and reflect on the inquiry process that was followed and discuss it from a methodological standpoint.

## **2.5.2 What took place in the complexity inquiry process**

The complexity inquiry process started in early 2009. In the first session, in March 2009, attended by about thirty people, I spent a morning explaining concepts of complexity. I described the history of the development of the ideas and also compared complexity with other theories. I described certain key concepts such as self-organisation and emergence. After this 'input', the group split into three inquiry groups and spent the afternoon considering, in a variety of ways, how and whether complexity is 'useful'<sup>31</sup> – at the personal, organisational and global level. These sessions were taped and I then responded in written form to the taped sessions – writing in the form of a dialogue with the discussants. I then summarised the themes that emerged for me through this process.

I then arranged a further inquiry in April 2009 attended by ten people; all but one had been there on the first day in March. At this session, we talked about using complexity to inform practice and I also shared my summary of the themes from the first session. These sessions were also taped.

Another session took place in July 2009 and followed a similar format.

This process is, certainly, a form of cooperative inquiry, but what form? This is what I want to consider next. It has proved to be fruitful for my own learning, and seemingly fruitful for participants, evidenced by their desire to establish an ongoing inquiry group, with about ten people continuing to meet together every few months over more than two years.

## **2.5.3 In what ways is this approach a cooperative inquiry?**

In what ways was the approach we followed a cooperative inquiry? I start by considering definitions of cooperative inquiry.

Cooperative inquiry is a form of second-person action research, defined (Reason and Bradbury 2001:xxvi) as follows.

'Second-person action research/practice addresses our ability to inquire face-to-face with others into issues of mutual concern, for example in the service of improving our personal and professional practice both individually and separately. Second-person inquiry starts with inter-personal dialogue and includes the development of communities of inquiry and learning organisations'.

One approach to such second-person inquiry is cooperative inquiry, described by Heron (1996:1) thus:

'[Cooperative inquiry] involves two or more people researching a topic through their own experience of it, using a series of cycles in which they move between this experience and reflecting on it together. Each person is co-subject in the experience phases and co-researcher in the reflection phases. It is a vision of persons in reciprocal relation using the full range of their sensibilities to inquire together into any aspect of the human condition with which the transparent body-mind can engage'.

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<sup>31</sup> I explored the concept of 'useful' in section 1.3.3.

In a cooperative inquiry, McArdle (2004:62) clarifies: ‘all the active subjects are fully involved as co-researchers in all research decisions – about content and method – taken in the reflection phases’.

Heron and Reason (2001:144) say cooperative inquiry is:

‘A way of working with other people who have similar concerns and interests to yourself, in order to: (1) understand your world, make sense of your life and develop new and creative ways of looking at things and (2) learn how to act to change things you may want to change and find out how to do things better’.

Heron and Reason (2001:145) also emphasise that ‘there is intentional interplay between reflection and making sense on the one hand, and experience and action on the other’.

So, building on all these definitions, I would suggest that to describe something as cooperative inquiry is to:

1. emphasise inquiring with others (rather than on your own)
2. work reflexively with more than one cycle of inquiry
3. move iteratively between reflection and action
4. create equality between inquirers in developing both the process and content of the inquiry.

So I will now explore to what extent the approach we followed meets all these conditions.

### ***Equality and inquiring with others (1 and 4)***

With respect to the *equality* of the co-inquirers – to shape the agenda, agree content and method, the approach I established did not entirely accord with this. I did have a planning meeting with the three people who helped me to facilitate the day (Gen, Michelle and Jim) and we did jointly design the process. But the process set me up as the ‘expert’ on complexity and I gave a lecture to start off the inquiry. Also, the choice of emphasis and form of the discussion groups later that day – the fact we asked them to reflect on the usefulness of particular complexity concepts – was set in this pre-meeting. And participants were not explicitly asked if they agreed with my overview of complexity theory or indeed if they agreed with the decision to discuss particular complexity concepts; they were asked if specific concepts – tipping, self-organisation and emergence – were *useful*. The process within the discussion groups, though, was co-inquiring, with people raising issues, building on what each said, reflecting back, taking ideas a little further. And this did include, as would be expected, challenges to my definitions and framings.

The next inquiry meeting was structured and designed by me. I wanted to get feedback on my summaries of the themes I had developed from the taped discussions; and I wanted to hear if the March inquiry day had influenced people’s practice. But subsequent meetings were shaped and co-owned by the participants - and what we discussed and how we discussed it was agreed by us all at the beginning of each meeting. So it *evolved* into a shared co-inquiry; my position as ‘expert’ diminished but did not entirely disappear.

In many ways the earlier sessions constituted *my* inquiry into how others saw complexity. I learned from listening to the way people discussed ideas, I learned from direct feedback and their discussion with me about my ideas. But, having said this, it is also true to say it was not *only* my inquiry; others

explored their own issues, got feedback from each other and from me on their own ideas and practice. So it *was* a shared inquiry, if less than a fully-fledged jointly-designed and owned cooperative inquiry.

### ***More than one cycle of inquiry (point 2)***

The process did follow a number of cycles; in the second session I was able to gain feedback on my learnings from the first session. And indeed in subsequent sessions I would sometimes describe what I had come to learn through my research and how that had changed my teaching or descriptions of complexity or process of engagement with groups. I would ask for feedback and others did the same. In a session held in November 2010, I formally asked certain of the core members of the group to reflect on what they had gained from the whole process and how it had changed their views and practice<sup>32</sup>.

### ***Cycle between action and reflection (point 3)***

As is a common theme in the research of this thesis, the primary process in this complexity inquiry has been reflecting on the meaning and usefulness of complexity thinking through the inner arc of inquiry, through *thinking* about how we act, what we see around us, how we reflect on past situations. There is emphasis on reframing and interrogating the concepts through *thinking* about practical situations, rather than emphasis specifically on planning and instigating new ways of acting. So the cycle of inquiry is more accurately described in this work as reflect-reframe-reflect, rather than reflect-reframe-act-reflect. So the complexity co-inquiry has been primarily about jointly re-thinking – with a view to the idea that it will influence how we choose to be and act in the world – but the ‘action’ has not been emphasised in this research.

Having said this, this is not entirely accurate in that, after the first meeting, people *did* talk about how they felt their practice had shifted as a result of the sessions and they *did* give examples of changed practice<sup>33</sup> – but in the main the process of inquiry cycled around propositions of theory or interpretation, discussion (which included reference to real experience) and then re-worked propositions.

### ***Conclusion***

The work in the co-inquiry described in Chapter Seven was certainly a fruitful inquiry for me. Through hearing others discuss their ideas, through reflecting back my own developing ideas, I developed my views in many ways: what is important about holding complexity as a worldview; how to convey and explore these ideas with others; what can get in the way of understanding and practice. So, in part, this was a first-person inquiry where the group’s reflective practices created some of the material that effected changes in me.

However, as well as a first-person inquiry, the process was also an inquiry into how a group, of which I was a part, worked with complexity concepts.

Thirdly the inquiry has also become, increasingly, a ‘purer’ version of cooperative inquiry, where the group shape the agenda, bring back discussions of practice and explore their own framings of what complexity means.

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<sup>32</sup> And their responses are described in section 7.6.

<sup>33</sup> For example, the group, at the instigation of Lycia, developed a framework to compare complexity and mechanical thinking and Fran took this further and has used it in her work with change agents.

## ***2.6 Ontological investigations***

The core pieces of action research I describe in this thesis take place in Chapter Three, the last section of Chapter Five (section 5.4) and Chapter Seven<sup>34</sup>. Chapters Four, Five (apart from 5.4) and Six take a different approach<sup>35</sup>. In Chapters Four and Five I am exploring the questions of ‘what is theory?’ and ‘what is science?’ And in Chapter Six I develop a classification of complexity into three research paradigms: complexity as realism, complexity as metaphor and complexity as post-modern science. What are the methods I use in these parts of the thesis?

Chapter Four, ‘what is theory?’, provides the backdrop to my inquiries into theory-making described in Chapter Three and in section 5.4. I explore how theory and other conceptual constructs such as paradigm and worldview are defined in the literature, and I explore theories of theory-making. I also investigate, through researching the writing of conceptual scientists and other reflective thinkers, how others describe their personal processes of theorising. This material then forms the counter-point – or in fact counter-points – to my own personal inquiries. Are my own theory-making processes congruent with espoused methods? Do they differ or overlap with the methods adopted by other scientists and conceptual thinkers?

Chapter Five, ‘what is science?’ was developed in similar vein. How is science defined and described in the literature? This then formed the backdrop for inquiring into how complexity theory fits with those definitions; in what ways is complexity a science?

Given my interest in this thesis as to how theorising happens, it is relevant to reflect more deeply on how I approached the work described in these chapters.

In one sense the approach was straightforward. I read Harré (1972), a seminal book on the philosophy of science and used Blaikie (2007) a comprehensive and readable review of qualitative research methodologies. Other people recommended books – such as Mitroff and Kilman (1978). I already had books on creators and scientists on my bookshelves. I dipped in to these, keeping in mind the inquiry questions that drove these chapters.

Having said this, structuring the argument in Chapter Four in particular was probably the most problematic aspect of writing this thesis. I really struggled to structure the material, to decide what to include in the chapter, what to present in an annex. Why was this? Perhaps because the subject is so vast and I was battling with the issue of how far to take my explorations; the topic could form the subject of a thesis in itself.

In contrast, the work for Chapter Five flowed much more easily. I imagine this is because I have been thinking about science for a long time – and teaching some of this history and philosophy of science as a way to help people see the traditional scientific worldview as a social construction, rather than as an incontrovertible ‘truth’.

If I now consider Chapter Six, how did I ‘invent’ the classifications of complexity described there? How did it even occur to me to do it – to develop these classifications – at all?

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<sup>34</sup> Although, as I have argued in section 1.3, the whole thesis is an emerging inquiry which moves between focus on processes of theorising, focus on testing these processes with others and then into periods of researching the literature and developing models and classifications.

<sup>35</sup> And Chapter Eight summarises the thesis and then looks forward as to how I am building on the work.



The work for Chapter Six, ‘what is complexity?’ emerged from my frustration with the primary focus on mathematical modelling in the complexity literature and my even greater frustration with the vague use, by some complexity enthusiasts, of complexity concepts. The difficulties and the dangers of use of complexity concepts was further emphasised in the co-inquiry work of Chapter Seven, where I listened, in the taped discussions, to the difficulties people had in deciding what such terms as ‘tipping point’ really mean. I began to feel that such concepts, in becoming things in themselves, can create more harm than good; they turn the world into ‘realist’ spaces populated by these concepts – a tipping point here, an edge of chaos there. They can get in the way of engaging and exploring directly, of seeing the world as it is.

So it began to make sense to me to group approaches to complexity into three broad camps: modelling, metaphor and this third emerging grouping I had begun to call post-modern science. This latter category, post-modern science, seemed the most ‘useful’ to me as I discuss in Chapter Six.

The idea, the initial trigger<sup>36</sup> to develop a classification came from attending a conference (in May 2011) where one of the speakers talked about Richardson and Cilliers’ (2001) classification of complexity and that prompted me to dig out Byrne’s (2009) classification. The particular *form* of the classification I develop in Chapter Six took some time to develop, moved forwards and backwards through a process of trial and error. I was seeking a degree of elegance and self-consistency. For example, it took me some time before I homed in on ‘research paradigms’<sup>37</sup> as a basis for classification. It was confusing to read the classifications of others in that they seemed to mix up some methodological terms (modelling), some ontological terms (post-modernism) and some even vaguer terms (complexity thinking<sup>38</sup>). And to classify, as I do, the ‘use of metaphor’ as a research paradigm is a novel step. It was also a step forwards to discuss the ontological basis for modelling and use of metaphor. I get the impression that many modellers – and certainly many Metaphorists<sup>39</sup> – do not pay explicit attention to their ontological stance.

## ***2.7 The approach to the thesis as a whole***

In this chapter I have described the research methodologies I use for particular aspects of the work for this thesis – a personal form of learning history and a co-inquiry and a more theoretically-based exploration of the ‘big’ ontological themes as to the nature of science and theory. But it is interesting to look at the approach to the thesis as a whole.

As I mention in section 1.3.2 the approach I have taken to the thesis is to allow interests and insights and ideas of what to do and how to do it to *emerge*. I have indeed kept focus on certain questions – in particular the focus on the nature and usefulness of complexity - but have allowed other questions to evolve from these during the course of the work. I decided early on to conduct a ‘complexity inquiry process’ as described in Chapter Seven, but I allowed the other methods I used and the particular *form* of the thesis to develop as I engaged with the questions and started to take some steps forwards. So the process of the thesis taken as a whole has been congruent with the idea of an emergent, path-

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<sup>36</sup> Which occurred towards the end of this research.

<sup>37</sup> I mean the idea of connecting ontology, epistemology and methodology together (which is how Blaikie (2007) defines a research paradigm).

<sup>38</sup> The term ‘complexity thinking’ is ambiguous. It can mean, as a verb, the process of thinking (a methodology) or, as a noun, a worldview. The paper was unclear whether it was both or either.

<sup>39</sup> I coined the term ‘the Metaphorists’ in Chapter Six, as a way to describe the users of metaphor!

dependent journey. I did not constrain my methods at the beginning, nor define the boundaries of a literature search, nor create fixed hypotheses.

I also note that the writing itself forms part of the research process. In other words, apart from undertaking the complexity inquiry described in Chapter Seven, I don't 'do' something and then write about it. It is through the writing itself that clarity emerges and ideas form. For example, in Chapter Five, it was through writing about the nature of science and considering the boundaries of science that it really came home to me the extent to which the boundaries of what is deemed to be science is a social construction.

It is worth pointing out the extent to which this open-ended approach was and is emotionally demanding. I have moved, in undertaking this work and in writing about it, between periods of excitement, where things flows, where what to do and the way to structure it seems clear and I feel poised, feel confident I have something to say. Then, at other times, I feel at sea again, unsure I have anything interesting to say, unable to see the wood for the trees, fuzzy, uncertain.

I expect that many writers and researchers would describe their research and their writing about it in this same way - as a dance between the intellect and the emotions, out of which some clarity, some sparks of creativity, sometimes emerge. But given the focus in this thesis on the process of developing ideas, it seems appropriate to make this comment.

## ***2.8 Summary***

In this chapter I have described the methods I use in undertaking the work of this thesis, specifically the use of a personal learning history, of a co-inquiry into the 'usefulness' of complexity, and of the way I have explored certain 'big' ontological questions as to the nature of theory and science and complexity. I have critiqued and positioned my methods in relation to action research methodologies and discussed their congruence with the ideas of complexity.

## Chapter 3 Complexity and Me

### *3.1 Introduction and methodology*

#### **3.1.1 The focus of my inquiry**

This chapter describes my inquiry as to why complexity theory has been of such central interest to me for the last ten or so years. The trigger for this inquiry came from a conversation with Gill, reviewing earlier work, as described below. The point she brought home to me is that, if we are over-identified with any theory or belief, it can distort what we see, how we interpret what we see and what we regard as important. Her comment really affected me. It affected me because it brought home to me that it was possible that my interest in complexity was driven by something other than it being, objectively a ‘good’ or ‘useful’ theory.

#### **3.1.2 The reason for this inquiry**

This inquiry into my own process of reflecting and re-framing is important for a number of reasons.

First, because if I am to continue to teach and promote complexity theory, then it is important that I dis-identify from it as far as is possible, that I see it clearly and objectively. I want to surface any hidden assumptions, identifications and needs that may be driving my thinking in ways of which I am unaware.

Secondly, I am interested in how to help others reflect on their own theories and worldviews<sup>40</sup>. If I can study my own process of re-framing, that should shed light on how I can work with others. Beliefs<sup>41</sup> drive behaviour and some of society’s scientific and indeed religious beliefs are not helping us to tackle and face up to the reality of climate change, the issues of continuing economic growth, the fact of inequalities. So my desire to help others in reflecting on their beliefs also has a political motive.

The third reason to include this inquiry is because I am interested in developing a research methodology which would allow the investigation of complex, emergent problems as they emerge. The methodology I am adopting here is to follow my own thoughts and actions as I grapple with this question ‘why am I so interested in complexity theory?’ What events and thoughts followed after Gill piqued my interest? I am attempting to research myself and give an historical account of my actions and thoughts and feelings. And I am doing this as I am interested in the difference between what we

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<sup>40</sup> By worldview I mean ‘a framework of ideas and beliefs through which an individual interprets the world and interacts with it’. A worldview may contain scientific elements but may also contain, more broadly, issues of belief. Our worldview may be obvious to us, but, more generally, at least in part, may be unconscious, outside our awareness. I explore this in more detail in section 4.2.

<sup>41</sup> Jean Hardy (2010) speaks about the importance of uncovering personal beliefs in her book ‘A Wiser Politics’. In this she looks at the writings of key political philosophers and how their personal views of human nature underpinned their ideas: Man is evil and must be controlled; Man is born blank and must be shaped by the political system; Man is intrinsically good and must be set free. She also makes the point that, of all the writers she explored, only Rousseau was self-reflexive, recognised his own beliefs and reflected on how they shaped his political views.

Hamilton (2010) also comments on the power of hidden beliefs in his example of ‘growth fetishism’. The belief that having more material goods will make us happy is so powerful and unassailable in driving behaviour, it is like a fetish. Challenging this view feels to some like an attack on the right to freedom and success, a criticism of the American way of life. He says we need to understand and surface these hidden beliefs and acknowledge their power if we are fully to tackle climate change.

come to believe happened post-hoc and what *actually* happens. Can I learn about the way I grapple with and modify my ideas, by being as true as I can to what actually happened and what I was thinking at the time?

Fourthly, this inquiry does bring into focus certain questions about the scope of complexity theory. Can it be a theory of relevance to understanding the individual or does it really just of relevance to broader systems? Can it include ‘the irrational, the numinous, the imaginal’, or does it focus on the concrete and measurable? By focusing in detail on myself and my own thoughts, can I learn something of more general relevance to the theory of complexity and the complex world?

### **3.1.3 The method of this inquiry and the reason for choosing this method**

So what follows in this chapter is an account, a history, of what I thought about, what I did, how I felt as I researched ‘me and complexity’. It includes examples of blind alleys and dead ends as well as what more obviously turned into fruitful and interesting inquiries. But as Darwin emphasised and complexity theory (following Prigogine) expanded upon, it is the *actual path* that is taken that shapes where you end up. Seemingly blind alleys or failures are stepping stones to what happens next. Sometimes what is forgotten and what failed is key to what then occurs. So I am adopting this narrative approach (narrative in the sense that I aim to give an account of what actually happens without intending to tidy it up) to try to get to the reality of how things change (or not) and how new ideas and worldviews emerge. I then accompany this with a commentary to reflect on and try to make sense of what happened and why. This approach is discussed in more detail in Chapter Two (section 2.4).

As I have said, this approach is very much in tune with complexity theory and evolutionary theory. I am interested in developing an empirical research methodology which fits with a complexity ontology, a theme to which I keep returning in this thesis. This inquiry will inform that methodological development.

So I need, in this chapter, to differentiate between what is in effect the story of what I did and thought and felt and indeed even concluded at the time – and how I have reflected on this story as part of my research. How can I look at this ‘story’ and react to it almost as if I were a third party? In order to make this as clear as possible, the story will be shaded beige and the commentary will be as normal text.

## ***3.2 The start of this inquiry; identification, the trigger, the change to the inner discourse***

### **3.2.1 Introduction**

I have been interested, indeed passionately interested, in complexity since 1999, when I first came across Peter Allen’s Complexity Group within Cranfield School of Management. Even then, I wanted to write a book about it and did indeed write a couple of chapters at that time. I ended up working with Peter and became a Senior Lecturer at Cranfield. I took the lead in developing an elective on complexity for the MBAs which we taught for four or five years. My interest in the area has continued unabated: it has underpinned and been a constant theme in my research work at Bath.

### 3.2.2 Identification

The strength of my feelings about complexity is exemplified by the journal entry below. It shows my strong identification with complexity<sup>42</sup>.

*3A July 2008*

I am writing this after an almost sleepless night following a discussion in the learning group about why I am so wedded to complexity. I feel taken aback at the strength of my own feelings. In the group I became shrill, spoke faster and faster, felt challenged, somehow, at the core of who I am. I lost track of time. These ideas are deeply entwined with my identity.

I can see, in this example, how much energy is caught up. When asked about my relationship with complexity, I didn't experience this as a neutral question but as an attack on my identity. I can still remember that moment in the group.

This ongoing passion has become focused, in my research work with others, on the question 'is complexity useful?' and I will say a lot more about that in Chapter Seven. But of course it begs the question 'in what way is complexity useful to *me*? Why have I had such a love affair with complexity; in what way has it served me or attracted me?'<sup>43</sup>

### 3.2.3 An important trigger: Gill's question

So when did this question surface as to the strength of my interest in complexity? I had not explicitly asked myself this question until I had a meeting with Gill. She had been an examiner of the diploma transfer I had made in the autumn of 2008 and had had some criticisms of one piece I had written and I wanted to understand her views more clearly. I met with her for lunch in February 2009, and below is part of what I wrote the day after the meeting.

*3B Meeting with G, February 2009, written the next day*

Gill explained something to me I had not entirely understood, which coalesced into two questions: (1) 'if I were standing outside the complexity paradigm, how would I see it?' and (2) 'what is it about my emerging self that is so in love/entwined with complexity?' She explained that what my 'ontology' piece [the piece where I was seeking to understand her criticism], in her view, had lacked was that sense of being able to move in and out of the paradigm and see it (partly) as a story that appealed to me for some reason and something that I could stand outside.

### 3.2.4 A shift in inner dialogue

This conversation (excerpt 3B) was very significant as I had not really thought along these lines before about myself. I would have said to myself, in relation to her second question, that I found complexity thinking useful because it was useful; that is to say a more accurate representation of the world than a mechanical, Newtonian view. Her questions to me had an impact. The next day I wrote:

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<sup>42</sup> 'Identification' is a psychological process, whereby the subject assimilates an aspect, property, or attribute of another person or some other, including a theory. (Laplanche and Pontalis, 1973)

<sup>43</sup> I note I use the language of love many times – 'wedded to complexity', 'entwined', 'passion', 'love affair'. In fact, when I was writing this, it was not long after the end of a relationship...

Gill's questions float around – and I think about why I feel so gripped by this writing I am doing. Partly I am like this – I tend to finish what I started . . . but is there a **purpose** that drives me? Complexity would say that we make our own purpose – that we are riding on a wave of our and the collective past and it may *feel* like we are drawn towards the shore – but in reality it is the collective past unfolding and yet, equally, being shaped by choice and chance.

So here is evidence of the start of my separation from complexity. Her questions had allowed me to ask myself a question, about purpose<sup>44</sup>, which I had seen as antithetical to complexity thinking. The complexity worldview implies, I would say, that fate or 'final cause' – or indeed 'initial cause' are both unnecessary, unlikely and, indeed, unhelpful. So I have tended to dismiss any thoughts about the purpose of life, or, indeed, about the purpose of me. And Gill's questions had allowed the question to surface. This is evidence of how I was starting to recognise my identification with the theory of complexity and some loosening of boundaries was happening simply as a result of Gill's questions. And I note that this was not a deliberate choice on my part, but just happened as a result of this trigger.

I began to wonder, had my intensity surrounding complexity theory closed down explorations I actually wanted to make, such as about purpose? Had I just introjected the theory, that is swallowed it whole, uncritically?

### 3.2.5 What has this shown me?

So I have already discovered something about my beliefs. When things I hold deeply are challenged, I can experience this as a personal attack (as in example 3A). When a question gets through my defences, I find it hard to drop – it 'floats around', as I say above, and may trigger new thoughts which I have previously denied, as with this example of thinking about purpose (3B and 3C)<sup>45</sup>.

## 3.3 Complexity as Me

### 3.3.1 Introduction

Because I have been steeped in Jungian ideas for many years and because I trained as a psychotherapist in the early 1990s, I have a tendency to draw on psychological theories and explanations, as will become apparent in this section and section 3.4. In this section I show how I started to question whether complexity theory was a metaphor for my sense of Self, building on Gill's question (excerpt 3B) 'what is it about my emerging self that is so in love/entwined with complexity?' Do I see myself as 'complex' and if so, what does that mean? And does complexity theory comfort me or legitimate me in some way?

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<sup>44</sup> When I use the word 'purpose' here, I am referring to 'big' purposes, such as the purpose of life itself or the purpose of my life. I am not discussing purpose in the sense of having intentions when we make day-to-day choices or act. A discussion of intentions in relation to complexity is included in Chapter Seven.

<sup>45</sup> Interestingly, having just written this, I watched 'the Book Show' on television. Sally Vickers was talking about her atheist and communist parents; she said they allowed discussion about everything except religion and that, after she left home, she became attracted to spiritual ideas that had previously been disallowed. I connected her sentiments with what was happening for me – had I disallowed myself to explore anything outside complexity?

### 3.3.2 Do I see myself as complex?

I wrote the poem below in July 2008. As far as I can remember, I just dashed it off one day off the top of my head. I cannot remember what prompted it. It took someone else to point out that it says a lot about how I was feeling about myself at the time. I was writing a lot at the time about ageing and despair and I chose to convey the sense of Complexity as a person not knowing the future, but still feeling things can always start again. But, it would seem, she, Complexity, faced this with sadness and a sort of hopelessness. In retrospect it is easy to see that I could have presented Complexity as young and vibrant with all to play for – but I did not. It is as if I have written my obituary under the title of Complexity.

3D (*written in July 2008*)

If Complexity were a person,

She would be an old woman, a wise woman,

A tired woman sitting in a cave, knowing she only has a little time left before it is too late.

She has had a long and mixed life; you wouldn't believe that she was once a wild dancer....

She has sadness and suffering; she has known death and knows that you can gather, always, the threads and start again; knit them together again and start again.

She has something of the stars in her, locked in her eyes; she has something of the ocean in her, still and deep and warm and icy cold.

She does not know what will come; she looks at the view beyond the cave, the fresh green of the spring morning bathed in milky mist; but she does not know what will come.....



When I reread this poem I continue to find it moving. The poem above suggests Complexity, the person, is wise in being able to see the *world* as complex, and is wise in being able to reflect on this.

### Is Complexity complex?

But is Complexity complex herself? I found this entry in my diary, written in February 2009.

3E *Diary Feb 2009*

I see myself as multi-faceted, hard to pigeon-hole; I don't fit easily into any archetypes – of consultant, scientist, researcher, woman, northerner, dog owner, reader. I don't seem complex to myself, I don't think – but I do live my life by wanting to draw on varied and differing threads and weave them together – and that image of weaving and new forms emerging is certainly part of the complexity image.<sup>46</sup>

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<sup>46</sup> I want to note a comment a colleague, Michael, made in reading this section. He said 'I agree totally, I have always enjoyed the metaphor of the weaver in relation to evolutionary journeys. And so we weave our own life

I note that I say ‘I don’t feel complex to myself’. I’m not sure I entirely agree with myself as I read this later. In one sense, perhaps, people *do* make sense to themselves; they are not a mystery to themselves. But I do feel I have many aspects and interests. When I speak to my neighbours, I imagine they see me as someone self-contained, with a little dog, someone who gardens and walks a lot. Others would know me as a part-time academic who lectures and writes things; yet others would think of me as an action-oriented business person, acting as chairperson or consultant.

Is that commonplace, to feel you have many aspects which come to the fore in different situations? Is it indeed the case that I have many aspects? And are they woven together or do I jump between them?

I can see some ways in which they are woven together. For example, my direct northern style, my northern working class roots which are coupled with a strong reflective streak means I can relate to a wide range of people and this has been a great help in my business life. I have always carried the sense of being an outsider (why is that? Working class roots in a privately-educated setting, an imaginative child in a practical, concretely-oriented family) and this has made it easier for me to take a critical stance, challenge the status quo (because I never did feel a strong sense of belonging, so to challenge and thus separate myself from the crowd did not seem much of a loss or risk).

I can also see some ways I jump between aspects of myself. I can be the tough-minded business woman who ‘does not suffer fools gladly’; in that mode I find it hard to keep hold of the sense of being in relationship with others. I am at those times in the grip of my ‘thinking function’<sup>47</sup>, intent on what I am saying. Then, at other times, I am acutely aware of others, warm, sensitive to what is happening for them and able to stay in touch with that sense of relationship.<sup>48</sup>

So I see myself as made up of many facets – connected together, negotiating between each other, shaping what I do and who I become. I see myself as having form – as forging a form out of the aspects of my life – the ‘community’ that makes up my personality, my interests, my family context, my choices, the accidental things that happen. I don’t see myself as chaotic or blown by the wind or entirely reactive. Neither would a view of fixedness or determinism make sense of my life. But I don’t experience the *form* I forge – or that is forged – as fixed. Indeed I find it disconcerting sometimes to experience the extent to which I change in different contexts, how I feel and act differently and how the story I tell myself about who I am and how I am depends to a surprisingly large extent on what I am doing and with whom.<sup>49</sup>

Perhaps this preoccupation with who I am is too concrete? Seeing myself (or anyone else) as a community of sub-personalities is still a realist project. Another approach, the Buddhist approach, would be to see myself as ‘empty’, changing, and to give ‘who I am’ less attention as, whatever and

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course and its meaning; we construct ourselves and our lives as woven patterns’. This is an example of the way a learning history is useful to the reader. I will return to this point later in the chapter.

<sup>47</sup> A Jungian term.

<sup>48</sup> There is a whole literature on the idea of the person being comprised of elements – archetypes or sub-personalities (for example Rowan 1990). The focus is on helping people to dialogue between aspects of themselves, to weave them better together. So ‘health’ is presented in this literature, as the state when we are aware of all these aspects of ourselves and can dialogue and negotiate between them. To connect these ideas more closely with complexity theory would be an interesting piece of work.

<sup>49</sup> This description of myself as formless fits strongly with the Buddhist notion of emptiness. Loy (2003:5) says: ‘For Buddhism, there are no self-existing things, since everything, including you and me, interpenetrates everything else’.



however I am may soon change, tip, self-organise into some new form.<sup>50</sup> We shape who we become and the lives we lead by the choices we make. And we make our life meaningful and purposeful in this way – although this is only part of the truth as we are also shaped by the choices of those around us and by the historical context into which all current choices are sited. I return to this idea in section 3.5.

## Working on the edge

Another piece of writing in April 2009 explores another aspect of complexity thinking – working on the edge.

3F *Inquiry April 2009*

I had had quite a difficult day running a workshop and I phoned up Keri, someone with whom I have worked for years, and talked it through with him. He said he saw me as someone who works ‘on the edge’ a lot of the time; that that is hard, draining, unsafe and that sometimes I will feel I have fallen off. I connected it again to complexity; does complexity legitimate my propensity to work on the edge? Do I not look for safety as I don’t expect it? Do I think I *should* be on an edge?

I have a particular antipathy to the phrase ‘edge of chaos’, as I discuss in section 6.2.2 so it is ironic that this writing should show I was considering this idea of me ‘on the edge’; is this an example of where strong feelings (my dislike of the phrase ‘edge of chaos’) can mask something I do not pay attention to (the fact I seem to spend my life ‘on the edge’)? And it took someone else to point out this irony to me in including this excerpt; I had not made the connection myself.<sup>51</sup>

### 3.3.3 Reflections on this; has complexity theory seemed relevant?

Who I am and how I live seem congruent with a complexity perspective – of elements of myself shifting and connecting, new patterns emerging as I both shape and respond to what is happening in my life.

Maybe part of what complexity theory does for me is to legitimate my approach to life? My life history seems to consist of doing challenging things and then wanting to move onto new things when I can do them. I never seem to want to milk the rewards of having got the hang of something. So this focus on change rather than stability, of becoming rather than being, is certainly captured by complexity. And I certainly seek to weave together ideas from differing disciplines and ages and societies.

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<sup>50</sup> Buddhist writer Loy says (2003:7) ‘we construct ourselves by what we choose to do’.

<sup>51</sup> Michael, in reading this chapter, commented that edges can denote fear. In fact he used the phrase ‘the edge of the abyss over whose edge we hardly dare to peer’. I found this very interesting. I wanted to ask him why he chose this particularly strong image of an abyss; what did that mean to him in his life? And then it occurred to me to ask why did I **not** use this image? Perhaps I don’t pay attention to my own fear? Perhaps if I felt fear more often, it might reduce my propensity to find myself so often on edges? And, conversely, why did I not present an edge as something full of possibility, as exciting? I include this diversion into Michael’s comments and my reaction to them because they exemplify how writing autobiographically, and then engaging with others through it – using it as a learning history as discussed in Chapter Two – does seem to trigger thoughts, learnings reflexively and give room for the reader to make his or her own connections.

So perhaps my interest in Complexity is partly that it legitimates who I am and how I operate? If Complexity were a person, he (note he) would understand me!

### **3.3.4 What have I learned from this that may be more generally applicable?**

The methods of reflection exemplified in this section – as I consider whether I am attracted to complexity because it reflects who I am and how I act – has two key outcomes. First, it demonstrates that such a reflective stance does help me to see why I might be attracted to complexity theory and hence helps me dis-identify from it, to see it more objectively. This is not to say that I reject complexity theory; rather it is to understand that in part the reason I am attracted to the theory is because it is congruent with my personality type and helps me feel comfortable with my life and my choices.

But if I am less identified with it, it may be that I will be more skilful in engaging with people with differing personalities, attracted to different theories. I may be more sensitive to the issues of identification and more able to connect to others, less likely to cut off and try to convince them of their folly. Given my wish to help others to surface their worldviews, this seems like an important step.

Secondly, the inquiry into ‘complexity and me’ has opened up more clearly to me the question as to how complexity theory fits with psychological theories of the nature of the personality. I do not develop this in depth here but it has emerged as an interesting question for the future.

## **3.4 Complexity theory as Other**

### **3.4.1 Introduction**

I have so far focused on how an image of complexity might be something I identify with. I have asked whether *I* am complex; and whether I live my life in a way that is congruent with a view of the *world* as complex.

I now turn to another aspect of psychological theory, which is to do with whether complexity theory acts as a sort of parent, or significant other. This is Winnicott’s (1965) idea that the Self is developed reflexively through engagement with the Other. This Other is often the Mother, but not necessarily. The Other, according to Winnicott, mirrors our developing sense of who we are and confirms our existence.

The way in which I came to consider if complexity theory was an ‘Other’ for me, the trigger for this inquiry – was in fact through a friend, Jean Hardy, a sociologist educated in the radical sixties. She is in touch with a wealth of literature that I have often not come across. She often produces books and ideas in response to what I talk about to her; she plays a part in the contingent way my ideas develop, another example of the way ideas develop in relationship to others.

### **3.4.2 Visiting Jean Hardy**

3G March 2009

Late March 2009, I went to stay with Jean. We had been talking about why I was so interested in complexity and the following day she produced a book, edited by Richards (1996).

In Jean's book, I spotted a contribution by Ken Wright (1996). He made the point that people sometimes use *theories* as the Other, as a way to reflect on and develop the Self. He said (1996:69):

'What is a good theory? A good theory is one that fits the facts. But if we are dealing with psychological theories – theories about the Self – a good theory is one that fits the subjective facts – in other words that fits the Self, and it starts to become clear **why** people often invest in their theories so emotionally...each person puts a part of his own Self into the theory he has espoused and then feels it to be a container of his own subjectivity, his own Self...*when the theory is challenged it is the Self that feels threatened....* [my emphasis]

I was struck by this quote as it fitted with my developing inquiry as to why I was so enamoured<sup>52</sup> of complexity theory. I was excited to find it, and remember buzzing with energy in making this step forwards, this sense of making progress in my thinking.

Wright's contention – 'that if the theory is challenged the Self feels threatened' – resonates with my experience of feeling under attack when questioned as to my interest in complexity (excerpt 3A). It also resonates with Hamilton's comments on climate change denial (see footnote in section 3.1.2). Wright was talking about the role of psychological theories in particular – but there is no reason why other types of theories could not have the same effect if we identify with them. We may cling to them like we may cling to a Mother.

### 3.4.3 What sort of 'Other' do I want?

I started to think further about the idea of 'Complexity as Other'. Winnicott says that our parent or parents usually play the role of Other. It is through our interaction with them that we shape our identity and know we exist. But, I seem to have used a theory, complexity theory, as this 'Other', in a way that is resonant with Wright's quote in excerpt 3G. Is that because my parents are *like* Complexity or because they are not? Or do I adopt Complexity as Other because my parents did not strongly assume the mirroring role of Other in my development?

I gained some evidence relevant to these questions through a conversation with my friend Sophy in May 2009.

3H May 2009

Sophy was promoting the virtues of Dawkins' (2006) 'The God Delusion'. I react strongly against this book and against Dawkins generally; I dislike his certainty and his narrow-mindedness and his derision of others' views. The conversation went backwards and forwards and then it occurred to me to ask what she liked about Dawkins. She said it was his certainty, his clarity and the fact he was prepared to speak out clearly and not be some wishy-washy Christian who took his children to church for social reasons and was not prepared to be clear about what he thinks.

I thought about it overnight and we talked about it again the following day. I said it was interesting that the very thing she liked about Dawkins – his logical certainty and

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<sup>52</sup> I use the word 'enamoured' here. I note back to an earlier comment in section 3.3 where I notice my use, in relation to complexity theory, of this 'language of love'.

determination to maintain that single-pointed view – was the very thing I did not like. I felt he did not dialogue with the reader – and indeed was the same on his TV programmes about evolution. I said that I was indeed influenced by not liking his stance on evolution – where in these programmes, in my opinion, he took a very single-pointed view (as developed in ‘The Selfish Gene’ (Dawkins 1976)) and did not allow other voices, for example from other socio-biologists, to enter the discussion except in passing. And he argued with others, such as a Kenyan preacher, others who were not so easily able intellectually to hold their own with him – rather than choose to converse with, say, eminent theologians or scientists who could have had a good debate on his own terms.

It seems to me that I regard Dawkins as a ‘Bad Parent’ (lack of dialogue, single-pointed, did not allow other voices) whereas my friend Sophy saw the same characteristics in him but viewed him as a ‘Good Parent’ (clear, unambiguous, strong, dependable).

I had in fact written about Dawkins at an earlier stage. I found the following extract, from my Diploma Transfer paper, in an exploration of the different ‘voices’ I use, written in August 2008, which also ‘rants’ about Darwin.

*3I August 2008*

I have been watching a series of programmes by Richard Dawkins about evolution. I find him very black and white and it feels as if he only has one question to answer and that is, ‘is it evolution or God?’ Everything seems to come back to this one question. I feel as if he is not prepared to consider the complexity of the topic – e.g. could God be regarded as the immanent quality that leads to evolution, could you believe in evolution and God if you took the Bible less literally, are there other ways of understanding evolution as well as the way proposed in his book ‘The Selfish Gene’? It feels as if he is trying to convince you of his point of view on this one question rather than give you the information for you, the listener, to explore the topic.

I am very struck by this and feel my reaction to the programme is consistent with my own inquiry moving on – i.e. I can see how I can have a tendency to vehemence, like Dawkins, I want to sell you my point of view, rather than listen to counter-views or give enough space for exploration and I can see how unhelpful it is. In terms of a psychological change process, there is a theory that starting to see things ‘out there’ (i.e. noticing this characteristic in Dawkins) evidences a change in me. I think this is as a result of inquiring into the differing voices and positions I sometimes take.

These excerpts (3H and 3I) are examples of where I am reacting against someone, Dawkins, who epitomises for me certainty and single-pointedness. In the second extract, 3I, I am also recognising that I sometimes have, or used to have, this tendency in myself. I can be certain that the world is uncertain, for example. But it seems that I don’t want an Other who has the qualities of Dawkins. It occurs to me that if we are mirrored by immovable Others, there is no reflexivity; they are not changed in interacting with us; there is no relationship. Either we like what we see in the mirror or we do not. Was this what it was like with my own parents?

So that is the next question. What about the actual ‘Others’ I had, my own parents? Were they like Dawkins or like Complexity? Or like neither?

### 3.4.4 My parents as Other

There was energy in my reaction to Dawkins. And then I tried to focus my attention on my own parents. Were they like Complexity, or more like Newton? Did they see life as nuanced and changing or as rather obvious, straightforward, clear? I think it would be true to say that they were rather more certain than exploratory, straightforward rather than imaginative, practical rather than creative. But I find the question not only difficult to answer but difficult and uncomfortable to engage with. I feel unsure, and even asking the question makes me feel guilty, disloyal. I do not seem to have energy for pursuing it as an inquiry in any more depth. But I can see that I lived my childhood in a world of Others who did not particularly share my enthusiasms and were not in the main seeking general explanations or meanings. They were rather matter-of-fact, black-and-white about things, not very interested in 'Big Ideas', nor particularly given to flights of the imagination. And so this 'theory of complexity' perhaps has assumed a role in legitimating who I am, how I live. And helps to reveal my own developing journey that I have woven in relation to those real Others.

What if I ask myself how I imagine Complexity as a parent? Complexity as a parent, would be open-minded, not sure of where things would lead, willing to hold ambiguity, flexible, responsive. Complexity as a parent would be mature, wise, interested in what was happening rather than in judging it, willing to experiment; interested in the broad context as well as the detail; curious, seeing life and himself as a process of becoming. .. I find this question much easier to answer; indeed I could keep on writing in answer to this question.

In process terms, I am struck that it is hard to inquire about something – in this case the role of my parents as Other in my development – just because I *should*, or I *wish to*, as a logical next step in the process. Inquiry seems to need to be connected with energy and enthusiasm. The thoughts just seem to dry up when I try to think about my parents in this way. But when I ask what Complexity would be like as a parent, then I can answer; a personal taboo of criticising my parents is perhaps side-stepped. So this is another demonstration that the path of my research is not entirely rational but is itself path-dependent and contingent on my own interests, on what triggers them and on what I avoid as well as who I know – and what books they read!

I am also struck that when I think of Complexity as a parent, I want to write of Complexity as a 'he'. I am reminded of some writing about my family which perhaps sheds light on this.

3J July 2009

My Father was a Worker, my Mother Beautiful, my Brother urbane and sociable; I was Clever. I think I was my Father's younger son. I helped Dad clean the car, went cycling, built fires with him in the garden, didn't mind 'mucking in'.

I am reluctant to comment on this excerpt but I think it speaks for itself.

I think Complexity would make a good parent, as He, the Theory, both validates my approach to life – in terms of creativity, experiment, becoming – and would reflexively respond to me; so I would change and learn and be seen – but so would He.

### 3.4.5 So where has this taken me?

So where has this taken me? I have found this exploration of complexity as a theory with which I am identified (complexity as me in section 3.3) and as a theory which has provided a reflective Other in

relation to which I have shaped my views and sense of self, both interesting and fruitful. I can see how complexity has been both helpful and constraining. Either way, this inquiry has created more space, more perspective. I do not feel so closely aligned to the theory. I do not feel it is ‘the answer to the universe’<sup>53</sup> but a helpful framing, an important way to approach the complexity of the world.

### ***3.5 The issue of spirituality***

#### **3.5.1 Introduction**

In the previous sections I have explored my identification with complexity, triggered by the question Gill posed to me (excerpt 3B) ‘what is it about my emerging self that is so in love/entwined with complexity?’ I now want to address a question related to her second question, ‘if I were standing outside the complexity paradigm, how would I see it?’ I found I reframed that question and started to ask, ‘what would I be free to think about if I were to stand outside the complexity paradigm?’

This has opened up an ongoing inquiry into issues of meaning and faith and spirituality. These issues have always been of interest to me – or of interest for a very long time, but in the more recent past, I had dismissed them and asking this question – ‘what would I be free to think about if I were to stand outside the complexity paradigm’ – opened up this arena again. I collect together, in this section, threads of that inquiry, which returns to me from time to time and moves a little further. I think the fact this inquiry – into faith and spirituality – has been spread over a long period has produced quite different outcomes than if I had only stayed with it for a while – not that I seem to have any choice in the matter; it just kept coming to the fore.<sup>54</sup>

This has been a very significant exploration for me. The work also shows how inquiry can have a life of its own, not consciously directed or intended. It seems to be there in the background, being mulled over, often unconsciously. I make what can seem serendipitous connections; I test ideas, get discouraged, re-group and set off again. There are a number of phases this inquiry has gone through which are not unlike Kubler-Ross’s (1969) work on grief – with strong emotions and stages of loss, depression and re-framing, as I will explore later.

I present this inquiry in some detail as I feel it is both significant in my own development and also represents a good example of how inquiry shifts beliefs and ‘worldviews’. It demonstrates what for me, have been the stages of this transformation.

#### **3.5.2 The starting point – the trigger question**

So the starting point for this inquiry, which seemed to start itself rather than be a conscious choice on my part, came immediately after Gill’s question, as shown in excerpt 3C. As I allowed myself, once again, to consider what I believe outside of a complexity worldview, then I immediately started to think about ‘Purpose’; ‘big’ purposes, such as the purpose of the universe, the purpose of life, the purpose of my life.

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<sup>53</sup> Which, of course, is 42 according to Douglas Adams, in *The Hitchhikers’ Guide to the Universe*!

<sup>54</sup> This connects with the notion of a ‘gestalt’, in Gestalt theory (Korb, Gorrell et al 1989); we cannot put down an inquiry until the energy leaves it, and it is (at least for the time being) complete.

### 3.5.3 A sense of loss

I had been brought up as a Christian and had been a church-goer for much of my young life. I do not now embrace traditional Christian beliefs. Amongst other things, I don't believe, I don't think, that the universe or life or Man has a God-given purpose. And I have been interested in what complexity thinking implies about Purpose as I have described in excerpt 3C. But what I could have added to that excerpt in March 2009 is that the recognition of the loss of belief in over-arching Purpose brought with it a sense of loss. Complexity theory creates a picture of co-evolution, of newness emerging which builds on the past. So what we do contributes to the creation of what happens next. So it gives purpose to leading a moral life, to being brave, to developing oneself to try to ensure that one's individual contribution is a positive one. But complexity theory implies there *is* no destination, no starting point, no salvation, no certainty and no Big Purpose. And that did create a sense of loss for me. And when Gill asked her questions of me, which allowed me to look outside the complexity paradigm, I could more clearly see – and indeed experience – that loss. I cannot evidence this from writing at the time, but I do remember that feeling.

### 3.5.4 Loosening thinking

After Gill's question, it seemed that my psyche itself started to think outside the traditional complexity paradigm. First, the word itself – Purpose – popped into my head, as shown in excerpt 3C. My thinking started to 'loosen', as I will now explore.

#### *Loosening my sense of self*

In March 2009, when I was staying with Jean Hardy, in the same book edited by Richards that I refer to in section 3.4, I also found a chapter connecting ideas of the Self to Buddhist ideas of emptiness. Coltart (1996:89) says:

'We cannot speak our Self. The signifier and the signified make up a complex whole, which is at any time beyond our grasp. It is, rather, our **sense** of self which is important to us. While this may be strong, it is neither definable nor stable, but constantly in process'.

Coltart's idea of the Self fits very well with a complexity view in that it emphasises that even we ourselves are not fixed or definable but, as she says, constantly in process. She then goes on to connect her ideas about the Self with Buddhist ideas (1996:90):

'Buddhism stands unique in the history of religious thought in its denial of the existence of a self .... I have alluded to these teachings because they seem to me to mesh with my own remarks on the Self and its lack of some central unchanging core, in its constant flux and modification, evoking paradoxically both a recognition and a strangeness'.

I felt exhilarated when I read this. As is often the case with my development of ideas, I had a strong emotional reaction. I wrote:

*3K March 2009*

I am not fixed, I am not really all that solid. I don't have to worry too much about defining who I am because I am ephemeral. To accept I am ephemeral is a relief.



So, I am showing how I was comforted by this notion of myself as ephemeral, as changing. It fitted with my own experience of myself and legitimated not trying too hard to work out who I was. And it started to connect complexity ideas with those of Buddhism. This was a shift for me in that, as I think about it, I had been continually trying to work out who I was, how I should live my life, how others saw me, how I fitted in. I can see that, whilst I espouse that the world is complex, I sometimes want to simplify myself, to make myself understandable.

So why do I include this example here? The significance is that I did not have this thought – about being ephemeral – before Gill’s question. I feel her question loosened my thinking (even though in this example, the thoughts were within the complexity paradigm, so this is not really an example of thinking outside that paradigm). Nevertheless I felt that Gill’s question had in general loosened my grip on myself; it released me to engage less logically. It was a loosening-up to decide that I do not have to try so hard to understand and define myself; and it is significant that I found this engagement with the idea of myself as paradox as a relief.

### ***Discussions in the science and spirituality group – staying with paradox***

There are other examples of staying uncertain, staying with paradox and incompleteness.

The period following Gill’s question was not by any means the first time I had thought about notions of spirituality, as I have said. In fact, I facilitated for a few years an ongoing group which looked at the relationship between science and spirituality. A couple of months after Gill’s challenge, it seems that my ideas were starting to loosen, as I show below; I was starting to embrace paradox and but did not recognise it at the time. At one particular meeting, in April 2009, we talked about Faith and Love. I remember I felt quite split as I discussed this – my scientific side struggling with the idea of faith, but my more human side yearning for something. I sent this email to Jo, one of the people who had been there:

*3L Email April 2009*

I notice my reluctance to have faith... I believe, in a Buddhist way, that how we are, how we act in the moment is, in a sense, all the solid ground that there is. I can just play my part in the minute details and choices of what I do. So I am clear on that bit.

Jo challenged me about my desire to be clear and I can see my desire to sort it [faith] out, to have an answer, is both impossible and unhelpful. And, as Jo said, it is as impossible to be certain there is no God as to be certain that there is. There is something about letting go in all this – it would be nice to relax into it.

I could *act* as if life has meaning, love... I am at least, if I do that, energising positive archetypal patterns (if I want to think scientifically about it). And I can see there **is** love – and beauty – but do I notice it, connect with it, draw it to me?

There is love and beauty and there is hate and ugliness – we make choices on what to focus.

What I felt at the time was relief at not having to know, not having to be clear; the same as the relief on reading that the Self is empty, as I described in section 3.3. And I can also see this theme of whether I need to be certain, raised in my discussion about Dawkins, is here again. It is quite ironic. Have I needed to be so certain that complexity is ‘the’ theory that I cannot allow myself to explore



and flirt with other ways of thinking? Have I been turning complexity into just another – albeit more sophisticated – form of certainty? Just like the Newtonian theory I am warning against?<sup>55</sup>

## ***Dreams***

The next example of a loosening of thinking comes through an increased interest in dreams and their potential role in our development. As I have already discussed, I have been interested in Jungian thinking for many years<sup>56</sup>. Jung had very interesting views on synchronicity<sup>57</sup> (Jung and Pauli 1955) and in fact coined the term. His view was that outer events and inner events were, as he has described it, acausally related. That is to say our inner world and the outer world are best thought of as two sides of the same coin rather than as different things. Jung saw the dreams we have, at least some of them, as representing and reflecting what is happening in our external life. Worldviews are held as inner processes, and dreams are inner processes, so dreams may have some relevance to explorations of worldview. And in this position of embracing paradox and opening up my thinking, I found a renewed interest in this subject of dreams.

The following reflections on one of my own dreams illustrate this seeming resonance between inner and outer.

*3M March 2010 A dream*

I have been very busy working on something that has been without doubt rewarding - I feel I am adding value, I have a role, it provides financial stability. But, as a friend said to me the other day, the work takes a lot of my energy. And I have begun to feel that it blocks me from my creativity. Then I had this dream. I dreamt of Kathy, my previous dog, who was lying in the hall on one of my jumpers, seeming very old and sick. I left Woody, my current dog, who was in the bright sunny lounge and went and sat with Kathy. I said to Kathy, 'I love you the best and you can do anything you want'. When I thought about this dream the following day, my interpretation was that Kathy represented the creative feminine part of me, that I love this part of me and that this part runs the risk of dying – and that, in fact, I want to let that part of me do what it wants and not be beguiled by the pull of the bright sunny 'male' world.

This dream was very significant to me at the time and has stayed with me since. Indeed I had many similar dreams following this one which all seem to speak to the fact that I have a tendency to get pulled into action and leadership and perhaps give less value or space to 'being', gardening, doing nothing, being with friends, wandering about. I 'extrovert' at a cost to my 'introvert'. I interpreted these dreams as pointing to the fact that I should stop doing the in-many-ways-rewarding but energy-sapping and overly-absorbing work in which I am involved and free myself up again. And this filled me with hope and joy.

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<sup>55</sup> This thought in fact sparked a whole new chapter, Chapter Six, 'What is complexity?' where I explore complexity as realism, as metaphor and as post-modern science.

<sup>56</sup> I think Jung's views of the psyche are quite in tune with a complexity perspective. His idea of archetypes I would liken to self-organised locked-in psychic structures. His idea was that we are all individuals, and that 'health' is becoming ourselves, finding our own path, rather than becoming 'normal'. As I have mentioned in an earlier footnote, looking at the resonances between Jungian and complexity thinking would be a fruitful future project.

<sup>57</sup> Jung developed this idea of synchronicity through analysing the dreams of Pauli, one of the early quantum physicists and they co-authored a book on the subject (Jung and Pauli 1955), following quite a long correspondence (Meier 2001). Jung and Pauli bridged the science/spirituality divide.

### 3.5.5 Starting to reframe – but returning to earlier themes

The next phase I went through in this inquiry led, eventually, to a reframing of what complexity is. But it was preceded by a re-visitation of the themes of loss and meaninglessness that I had dealt with a year earlier. It is tempting to tidy this up and present a clear process of progression but that is not what happened and some of what I write in the next section resonates strongly with the stage I went through following the conversation with Gill.

#### ***Loss again***

In August 2010, David Loy's (2003) book on Buddhism and social action, 'The Great Awakening', was recommended to me. In this book, Loy comments on the issue of the 'loss of innocence', the loss of security accorded by what he calls the 'sacred canopy' that traditional religion offers. He says the loss of this sacred canopy leads to an 'anxiety-producing loss of security'. He says (2003:13):

'Both individually and collectively, the freedom to determine one's own path is shadowed by an anxiety-producing loss of security due to the disappearance of one's transcendental foundation – a sacred canopy...that answers our deepest questions about the structure and meaning of the universe, and where we fit into that....'

His point is that religion provides us with security, meaning, redemption and support. So, in facing up to the fact that religions are (in his view) essentially man-made, we are going to experience a sense of loss and an anxiety<sup>58</sup>.

I resonated with this sense of loss that Loy describes. I wrote at the time of reading it:

*3N August 2010*

I think I have rejected considerations of faith or purpose or destiny because they do not easily fit with complexity. Or at least complexity suggests we co-create purpose, that the future is an out-coming of the collective past; that faith is in our values and actions, embedded, not external or transcendental. And I agree with this but probably have not given space for my sense of loss in this thinking. I think I have a yearning for a Parent who reassures me it is all going to be ok, that I am loved, that there is a point to my life, that everything is on track, that I have not made insuperable mistakes and ruined my life. Allowing myself to admit this yearning, rather than banishing the thought entirely, has been comforting in a rather vague, indirect way.

I recognise this is a repeat of the themes I was developing a year earlier, in 2009 and discussed in sections 3.3 and 3.4. The point I am trying to make here is that I re-stated those thoughts and discussions again, a year later. But this time I wrote more explicitly about loss (as I said earlier I remember feeling this sense of loss at the time of writing the excerpts in those earlier sections – and indeed loss oozes out of the poem on Complexity (3D) I wrote in 2008 – but I did not name it as such). And the last sentence of excerpt 3N also signifies a change – as I talk, at this later stage, about *admitting* the sense of loss, this sense of 'yearning for a good Parent' and I am aware that the recognition brought me some comfort.

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<sup>58</sup> See the earlier footnote in section 3.1.2 re climate change denial; Hamilton makes the same point.

### ***The start of an integration, facing the hollowness***

My recognition that facing the loss brought comfort resonates with where Loy goes next with his argument; the fact that facing this sense of loss means that the loss is integrated and leads to a shift.

Loy says (2003:30):

‘It turns out that our hollowness is not so awful after all; it is not something that needs to be filled up. We cannot make ourselves real in the ways we have been trying – the bottomless pit swallows up our efforts – but we can realise something about the nature of the hole that frees us from trying to fill it up... Instead of being a constant anxiety that haunts me, the nothingness at my core turns out to be my freedom to be this, to do that. This liberation reveals my true nature to be formless.’

What Loy is describing is that, by facing our loss of meaning, by entering the bottomless pit, as he says, we find ‘our hollowness is not so awful after all’. So Loy points the way to escaping from loss by following it ‘all the way down’.

I *did* seem to face it – again – this sense of being ephemeral, context-dependent, empty, hollow. In an email (August 2010), I wrote:

3N August 2010

I can see I am in a process. At present I am really shocked by the way life is transitory and so am I. I find myself noticing the extent to which ‘how I am’ is so context dependent – and how I can’t even remember half the time what seemed so critically important yesterday. And how I tell myself stories about my life and who I am just to try and make it more real and tangible. But it does not work.

It just feels that everything I do and work so hard for, seems transient, illusionary and rather meaningless.

These are returns to earlier themes, discussed in sections 3.3 and 3.4. But I feel the sense of loss is cleaner, clearer, more defined, even deeper. This depressive feeling floats around the excerpts in those earlier sections but was not ‘owned’ by me at that earlier stage to the same extent as here.

### ***A reduction in hubris***

This depressive theme then took another turn. As I often do when I feel rather lost, I hunt on my shelves for a book that might have something helpful to say. I selected another Buddhist book, ‘The Taste of Freedom’ by Sangharakshita (1990).

3P August 2010

Sangharakshita says (1990:42)

‘Understanding means appropriating; it means taking the subject of knowledge unto oneself... so, because we have, as we think, understood Buddhism, because we have appropriated it and made it part of ourselves, – we start feeling superior to Buddhism, because we have ‘mastered’ it.’

What I realised in reading this, is that this is what I do with complexity. I seek to understand and ‘command’ complexity. It is a form of superiority to assert that I grasp this

theory and equally assert it applies to everything. But it leaves me without mystery or the potential that there is much beyond my understanding. It leaves me hollow. It leaves out that which is not ‘mind’.

This excerpt is a clear example of a shift I was making; to see how my strong grasping of complexity theory was leaving me hollow, was leaving out the possibility of mystery or ignoring the possibility there may be things beyond that which I (or we) could understand. This excerpt signifies a reduction in hubris. I cannot ‘command’ the theory of complexity and it cannot apply to everything. Again this is a return to an earlier theme and again, I seem to have more clarity of feeling about this sense of what complexity, seemingly, does not allow, chooses to ignore.

### 3.5.6 A further shift and reframing

This allowing of what was outside complexity (and, perhaps, what was outside what I could tackle with my logical mind), took another step forwards when, in October 2010, I spent a weekend at a workshop where we listened to interviews with Marie-Louise von Franz recorded in 1985 (von Franz). She was one of Jung’s circle and these recordings explored her ideas, her ontological stance, and the way in which she made dreams central to her work with individuals. In relation to the theme I have been following, about meaning and purpose, she emphasises in parts of these interviews that meaning comes from the fact that we are all unique, that we have a unique place in the world. This theme of uniqueness – of who we are, of what we do – is very much in tune with complexity thinking.<sup>59</sup>

When asked whether she believed in predestination, von Franz said that our life is constrained to a degree by the fact that we are born into a pre-existing pattern – of culture, family, race, gender and so on. But she made clear that there is also leeway to work with and to re-work/re-weave such patterns, to make choices – and the more we are conscious of these patterns, the more able we are to make judicious choices. I see this as very congruent with the Buddhist idea of emptiness and with the idea of path dependency in complexity thinking.

I became very engaged at the time in what she said about where dreams come from, about life after death, as shown by the following writing.

3Q October 2010

Marie Louise was asked in the interview why, if she saw dreams as communication from the collective Self<sup>60</sup>, dreams were not more clear, and her answer was that the collective unconscious<sup>61</sup> was the voice of cosmic matter in us. She said, *‘In the way that the language of atomic physics still cannot entirely capture what is going on, perhaps the voice of the cosmos can also not entirely be understood’*.

What I found inspiring about these ideas is that they are congruent with the message of complexity and evolution, and in addition provide a place for the unknowable and the numinous. They remind me again of the value of grasping my own uniqueness. I have felt

<sup>59</sup> I emphasise the importance of contingency and uniqueness in complexity theory in several places; see, for example, the overview of complexity in Chapter One.

<sup>60</sup> Collective Self is a Jungian way of describing God.

<sup>61</sup> Collective unconscious is the culturally-held archetypal patterns of thought as exemplified in myths and fairy tales – it includes symbols such as death, mother, evil, the temptress, and so on.

very uplifted by what she had to say and it has linked for me, a complexity worldview and the spiritual and the issue of meaning.

During this weekend of listening to these tapes, I had another dream. I dreamed that I was teaching a session on complexity and people were not interested, would not concentrate, said they had to go somewhere else. I kept trying to bring them back to the point, but their answers to my questions did not fit with where I was trying to take them. I interpret this as a further loosening of the grip of the theory and also the start of a reframing of what the theory is.

### ***Reframing a complexity worldview***

What I find interesting about this excerpt is that I start to talk about reframing a complexity worldview. In general, most mainstream complexity people explore the world from a realist position<sup>62</sup>. They tend to talk about people as ‘things’ – albeit complex potential evolving things – linked by ‘forces’ – albeit non-linear forces which can themselves change. What I am starting to explore in this excerpt, as I talk about linking a complexity worldview with the spiritual, is a widening of a complexity perspective. A complexity worldview is a systemic view, a holistic view. All that is there can potentially play a part in the reflexively-developed patterns that emerge. So why should the ‘all’ not include dreams, the numinous, intuition and so on? Why should we only focus on the objective and real components of our world? My dream (3Q) supports the idea that I am becoming less wedded to the mainstream view of complexity, and also less concerned that people ‘get it’.

This is a really important move for me and a really important point to emphasise. I am reframing my notions of complexity to embrace a wider perspective and, as I write this, I am finding it uplifting. I started by daring to go outside the theory, had strong feelings of loss, came to terms with those feelings, then had the thought that, actually, why can it not be the case that these things that realist complexity thinkers place *outside* the theory could not be *inside*? This feels very exciting – also sort of obvious and as if I have always thought this way<sup>63</sup>.

### **3.5.7 Integration and peace**

And, (writing this in November 2010), as I re-read the above sections, I find that I no longer relate so strongly to the sense of hollowness that I described earlier; something has shifted in me. The idea – (in Gestalt psychology (Korb, Gorrell et al. 1989) , for example) that, by paying attention to what *is*, something often shifts – has been my experience. So my reframing has happened not only on a cognitive level, but also, and perhaps more so, on a feeling level.

And, as indeed shown by the repetition of themes of loss and concern about identity between 2009 and 2010 that I have discussed above, that does not mean those feelings never return, that we do not go around the loop again. But when they do return, it is perhaps in another way, sometimes lighter, sometimes in fact deeper but more contexted and connected. And am I changed as a result? I feel more spacious, less tight, more flowing, more at peace.

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<sup>62</sup> And I develop this theme in detail in Chapter Six.

<sup>63</sup> Gestalt theory (Korb, Gorrell et al, 1989) is consistent with this point – that when we have completed a gestalt, and the energy diminishes, we cannot quite see what the fuss was about. We seem to forget, energetically-speaking, the journey we have been on as we integrate the new perspective.

### 3.5.8 Gaining perspective

I have followed the threads of this inquiry into my relationship with faith and the numinous over a two-year period. I am very interested in how Gill's question to me as to what it would be like to stand outside complexity theory seemed to put in motion a process of personal change: a recognition of a sense of loss and longing; a move to a new place where the grip of complexity is loosened; a different relationship to the spiritual, unconscious, the cosmos; and out of that a new understanding of complexity emerges. So this inquiry is a live example as to how inquiry can shift deeply-held worldviews and beliefs, how this operates on an emotional level as well as on a thinking level and how it repeats itself in loops, does not move in a linear fashion towards completion.

I notice that it is not always possible to see these transitions while they are occurring<sup>64</sup>. And we do not always personally notice things that are relevant to what we are experiencing. As an example of this, the following quote by Judith Butler is very much in tune with this inquiry process into stepping outside of a theory. Butler (1992:9) says:

'My position is mine to the extent that I.... replay and resignify the theoretical positions that have constituted me, working the possibilities of their convergence, and trying to take account of the possibilities that they systematically exclude.....The I who would select between them is always already constituted by them....these positions are not merely theoretical products, but fully embedded organising principles of material practices and institutional arrangements, those matrices of power and discourse that produce me as a viable 'subject'.'

Butler is talking about replaying and resignifying the theoretical positions that have constituted her. She talks about trying to take account of the possibilities that such theoretical positions systematically exclude. This quote is directly relevant to what I have been doing in this chapter in looking at issues of meaning and purpose and spirituality.

The interesting thing is that when I was given this quote by Chris sometime in 2009 when Chris could see that it was relevant to my exploration, it did not speak to me at all. It was only much later, when I was much further into tracking the process described in this chapter, that I realised how relevant it was. This is an example of how we do not always recognise something of value to us until we have incorporated it into our view; otherwise we can be blind to it.

I also notice that the 'journey' of this reframing, required attention to be paid to what I was feeling and thinking not only at the time, but retrospectively. I needed to return to earlier writing and sometimes only *retrospectively* did I notice what had been happening. For example I did not notice at the time I wrote the complexity poem to what extent it was filled with loss. What I am reaching for is to suggest that the whole Gestalt does not come to completion without seeing it as a whole, without reflection and looking backwards; it does not 'just happen'. It seems to require consciousness.

I connect this to Torbert's (Torbert and Rooke 2005) 'Seven Transformations of Leadership'; he recognised that only on transformation can you see clearly the stage before. We see where we have been, not always where we are and almost never where we may go, psychologically speaking. It was only at the completion of this inquiry that I realised what I had in fact done was expand what I deemed to be complexity theory. I had not set out to do that, nor had I particularly wanted to – but the

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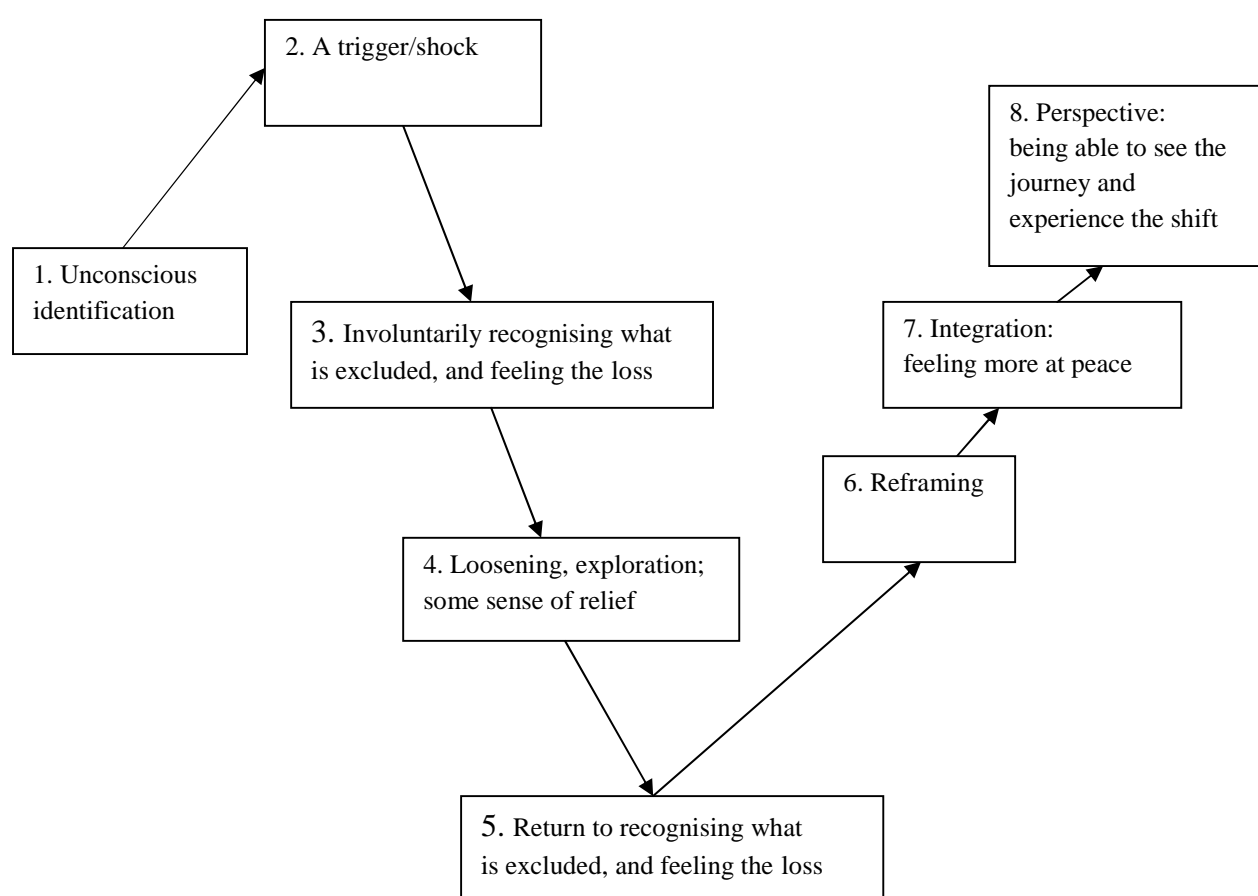
<sup>64</sup> Gillian Beer (1983:6) says of evolution that we do not know it is happening in the moment.

challenge from Gill set off a train of events and explorations which, through paying attention to them, both at the time and retrospectively, led to this transformation.

## 3.6 An overview of the process of shifting perspectives

### 3.6.1 Summary of the stages of reframing complexity

In section 3.5 I have shown how, over a period of two years, I set out to understand why complexity theory was so important to me, started to think ‘outside of’ complexity and found myself reflecting on my spiritual beliefs. This led to a reframing of how I see complexity theory, allowing it to expand into a broader worldview which can, in principle, embrace the numinous within it. I have mapped out the stages I went through in doing this in the previous section and I now want to see if I can abstract an underlying process which might be of general usefulness in helping others to dis-identify from and shift their theoretical perspectives. I then want to compare this to other processes in the literature.



The diagram above summarises the stages I have been through as I have grappled with the challenge from Gill when she asked me about my identification with complexity theory.

Theses stages are (these tie up with the section headings of the previous section, 3.5):

1. **Unconscious identification:** I sit ‘inside’ the theory but am not consciously aware of this
2. **A trigger/shock:** Something (a question, a challenge, something I read) jolts me out of this position, makes me more aware of my stance

3. **Invasion:** thoughts and feelings ‘not allowed’ through the identification surface, including a vague sense of loss
4. **A loosening up:** new ideas, new inquiries; some excitement and relief
5. **A return to depression:** loss, but a deeper, clearer inquiry and a more conscious recognition of what I am feeling
6. **Reframing:** starting to re-shape my worldview
7. **Integration:** a sense of completeness, peace
8. **Perspective:** able to see retrospectively, make some sense of it all, see it as a whole

I note in particular that stage 3 – invasion - felt somewhat involuntary. I did not seek to think about what was outside complexity; by starting to accept that maybe I was over-identified with it, the thoughts as to what it excluded – i.e. issues of purpose – came into my mind, together with associated – if vague – feelings of loss.

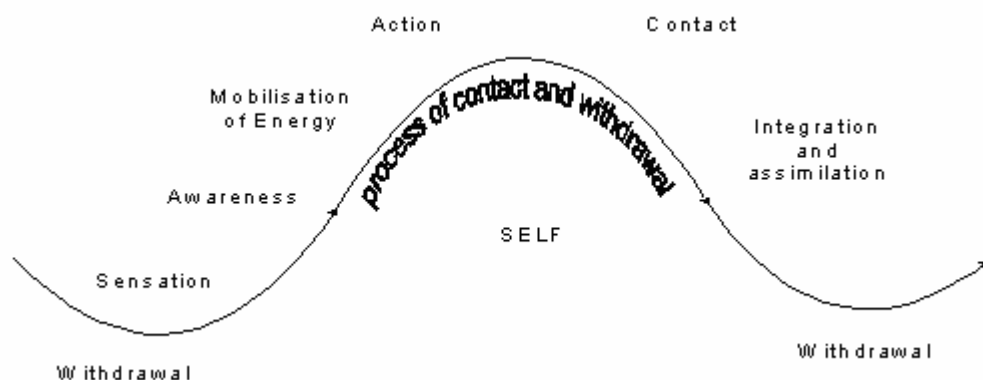
I also note the extent to which feelings and thoughts have gone hand in hand throughout this process. My thinking and feeling did not happen separately<sup>65</sup>.

Stage 3 was also revisited in stage 5 but more consciously and at a deeper level. It felt more complete. I also noticed how the reframing stage led to incorporating into the theory what had been outside of the theory. So in this example of reframing it was not a case of discarding a theory, but of expanding it.

I am also struck by the importance of stage 8, perspective. As I discussed in section 3.5.8 the change in its entirety required reflection and attention to what had happened as well as what was happening. I think this is an interesting point that is not perhaps well-recognised and calls for further exploration.

### 3.6.2 Comparison with other models of transformation

#### *The Gestalt cycle*



<sup>65</sup> This reminds me of a paper (Perkins 2001) I read some time ago comparing Aristotle's view of why Man differs from animals with that of Mencius. Aristotle put the difference down to the art of thinking; Mencius talked about Xin, translated as heart-mind and gave examples such as compassion. Clearly it is a moot point as to whether animals and Man are different and whether non-human animals do or do not feel compassion – but the connection with my work here is that the Eastern philosopher did not see feelings and thoughts as separable whereas, in our Western tradition, we do.

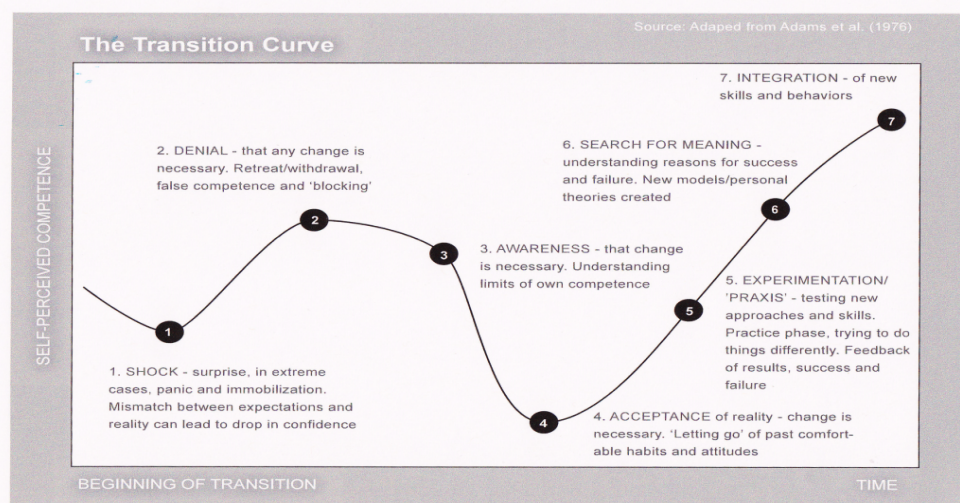


I was interested to compare the process I seemed to have followed with other such processes discussed in the literature. One such theory is the Gestalt Cycle (Korb, Gorrell et al. 1989). I have mentioned the idea of a 'Gestalt' several times in this chapter. This cycle emphasises that by paying attention to where there is sensation and becoming aware of this, energy can be mobilised. There is a process of contact – with the issue, the energy, then integration and assimilation followed by withdrawal, when the 'Gestalt' is complete. The Gestalt cycle is used to explore where people get stuck in any attempts at transformation. So an example of its use might be to explore how someone remains stuck in a relationship with a parent even years after that is appropriate. So, if the parent were bullying, the person might not ever feel anger and may also cower away from others in authority; he gets stuck and does not even sense his feelings or 'stuckness'. The process would emphasise the need to explore and then try to stay with the feelings about his parent so that energy – in this case, perhaps anger – can mobilise and he is really in contact with his feelings. Through this connection, so the theory goes, he is able to move through this stuck process and move beyond. And so it would help him to disengage from that stuck relationship but also to ensure that a similar pattern of behaviour did not play out with other people in positions of authority.

This cycle does have some resonances with the process I outlined above. I certainly noticed a mobilisation of energy when things started to shift for me. Indeed, this heightening of feeling often seems, for me, to accompany an emerging change; in this case, as exemplified by my reaction to the questions about my involvement in complexity in excerpts 3A and 3B. I also noted a sense of integration and also of withdrawal, in common with the Gestalt stages.

One of the difficulties in writing about such inquiry processes as in this chapter is that when they are completed, what seemed of great importance and interest at the time, can feel rather as if it happened to someone else. This completion, Gestalt theory would suggest, means that if the shift is assimilated, it loses potency and seems less critical after withdrawal.

### ***The transition curve***



Another model with which it is useful to compare is the transition curve, developed by Kubler Ross (1969) from her original work on stages of grief. This curve describes the way people deal with change or loss or the need to improve performance in some way. As with my experience, the process of transition starts with some sort of shock: a bereavement, some strong feedback on performance, a job loss or, as in my case, a well-targeted challenge.

I am not sure I went through a stage of denial, but there was certainly a phase of awareness and acceptance and experimentation – not so much experimenting with changed behaviour as with changing ideas. And there was finally a search to integrate new ideas and develop – or find I *had* developed – a more embracing worldview. So, again, there are strong resonances with this model.

### **3.6.3 Conclusions; how does the process I uncovered link with complexity theory?**

I hardly like to admit to this, but it took someone else reading this to point out that what I have described in detail here is an example of a tipping point of a personal reframing of worldview. I say that I hardly like to admit it because the subject of tipping point comes up many times in this thesis; indeed it is probably the most-explored complexity concept in this thesis. The ability not to notice your own process sometimes beggars belief and it gives strength, once more, to the need for reflexive learning with others, for feedback and reflection. And it also gives weight to the ‘use’ of this method to co-learn with others. The reader who pointed out that I had described a tipping point, caused me to learn something, but perhaps learned something himself, reflected for himself on the nature of ‘tipping’.

And, in the language of ‘tipping’, it is interesting to notice in this account<sup>66</sup> that I *started* to tip, then tipped back again then finally tipped more fully, evidenced by the sense of completion I felt.<sup>67</sup>

So, I can now say that what I have described in this chapter is a tipping point in the realm of ideas, a tipping point of inner process. And this example is an example of change happening primarily in the inner world. In this example, I did not learn or change through action, but by paying attention to what I was thinking and feeling<sup>68</sup>. This is very much the approach of Gestalt psychology, and very much about the inner arc of inquiry (Marshall 2001) as discussed in Chapter Two. This is to be contrasted with Argyris’s (1976) model of double-loop learning which focuses much more on the way we reframe through comparing what we do with what we say we do; Argyris’s model deals with learning through actions – through linking the outer arc of inquiry with the inner.

## **3.7 Conclusion; returning to the inquiry questions**

In section 3.1, I set out the reasons for undertaking the work of this chapter and I want to return to those reasons to see to what extent I have dealt with them.

The points were:

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<sup>66</sup> This is shown by the steps I define in the process which took me into loss for a second time.

<sup>67</sup> This is a very interesting point in relation to a discussion on tipping points in Chapter Seven where Margaret asks the same question. ‘Do you just tip or can you tip back?’ This inquiry here shows some of the ‘complexity’ that happens in practice. I did not just ‘tip’, cleanly, once and for all.

<sup>68</sup> And how I was affected by feedback from others and things I read in books – so the process was in some cases externally-triggered, not in its entirety a self-contained inner process.

1. Am I identified with complexity theory or has that changed?
2. Have I learnt anything about how to help others reflect on theories and worldviews?
3. Has this method of inquiry been helpful? Is it a good method to allow the investigation of emergent and complex problems?
4. Has my view of complexity theory changed?

### 3.7.1 Identification with complexity

I feel that my identification with complexity as a theory has changed as a result of this inquiry, as a result of the work described in sections 3.3, 3.4 and 3.5. I feel that I have expanded its meaning to me, allowing for a greater acceptance that many things in our complex world cannot be known or understood but nevertheless they will play a part in what emerges and occurs in a complex world. This new position has freed me up and allowed a more accepting or open-minded attitude to those things we cannot know: a greater willingness to embrace paradox. And a greater ease in speaking and lecturing about these ideas – less anxiety that people might not ‘get it’, that I might not explain it well, that I am failing if they don’t understand and accept.

This is evidenced in part by some feedback in an email from Chris, in Summer 2010, on my lecturing.

‘I see you ...open to possibility and playing with ideas, and experimental, too. The prime thing I see is you presenting yourself / your life as being congruent with the complexity message and you doing this in a way which is not current stuffy paradigm.... [You are] not nailing people with it.’

This shift is also exemplified by a lecture I gave in January 2011<sup>69</sup>, where I included a discussion on dreams and the numinous and talked about the image below<sup>70</sup>, which was resonant with a personal dream and depicts the person ‘piercing the veil of appearances to see the celestial frameworks within which they exist’.



<sup>69</sup> The lecture can be viewed at [www.schumachercollege.org.uk/community/complexity-as-worldview](http://www.schumachercollege.org.uk/community/complexity-as-worldview).

<sup>70</sup> From an engraving by an unknown artist, first published in Flammarion’s 1888 book ‘The Atmosphere: popular meteorology’.

### 3.7.2 How to go about reflecting on worldviews

What I have learnt through this inquiry is that I needed to engage with, pay attention to, what I *felt* as much as with what I *thought*. So, if I were designing a process to help people explore worldviews, I would need to ensure it gave space to explore for both qualities – and together. This seems really important and is really an important framing. Worldviews are as much if not more about deeply-held-but-often-unacknowledged feelings as they are about any rational understanding.<sup>71</sup>

And I needed to follow where my interest took me; I could not engage with ideas just on the basis that I thought I should (as evidenced by the lack of energy in thinking about the characteristics of my own parents). The process, to some extent, followed its own path and I needed to ‘follow the energy’ and ‘pay attention’ rather than direct what I did. So the Gestalt idea of noticing where one’s interest and energy lies certainly was relevant.

And the sense of dip, the sense of emptiness and hollowness was a critical part of the process too; that I felt even worse – and in despair – before the transformation happened.<sup>72</sup>

And it is also noteworthy then that when the shift is over, it feels over. The new position feels ‘obvious’. So helping to engage with people on this type of transition is tricky. If you do it well, they may not feel that anything has happened.

### 3.7.3 Has this been a good method? Might it have more general applicability?

This has been a great method for me! I feel excited by both the method and the shift in me. I feel that this sort of journaling, historically-based, narrative account and the underlying intention to try and follow the details of the journey, including feelings, has allowed something to surface and has enabled the capturing, the evidencing of that. I think the method both *supported* the change (through paying attention) and *described* how the change happened. Some of this account was retrospective (in going back to 2009) but some was being written at the time it was happening (in 2010) and I can see value in a mixture of both.

It has also been very interesting to see how the one or two people who have read this chapter have reacted. The readers, without particularly intending to, provided in their feedback new ideas to me, but also triggered development of their own thinking. So I feel such an approach does form a ‘learning history’, albeit a history of one person, Me, written by one person, Me. But this history has been iteratively reflected upon by not just by Me but by others too. And it is interesting to ask whether the readers would have been as engaged with a less personal, more tidied-up version than this attempt at detail and authenticity. I have demonstrated this point – the reaction of the reader – in one or two

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<sup>71</sup> Joanna Macy (whose PhD (1991) was on the connection between Buddhism and systems thinking) is masterful at designing processes which confront people at a feeling level, not just at a conceptual level. See, for example, Macy and Brown (1998).

<sup>72</sup> This sense of despair just before a transformation is well-documented in working with people overcoming addictions. For example Alcoholics Anonymous programmes recognise it. Maybe despair and depression are unavoidable in shifting inner dialogues? Clive Hamilton (2010) says the same in discussing climate change denial.

places<sup>73</sup> but could have developed this further and indeed was tempted to send this chapter back to be re-read by Michael and gauge the next response in the iteration.<sup>74</sup>

So I think such attempts at learning histories do, indeed, capture the contingent, path-dependency of the personal stories and capture the subtlety of the changes and what drove those changes in ways that a more conventional account would not. Such a process would indeed seem to have a place in a methodology to research complex emergent processes; a method that could investigate emergent phenomena not just retrospectively but as new things emerge, ‘in the act’ of emerging.

### 3.7.4 Has my view of complexity theory changed?

It is important to summarise in what way this work has led me to reframe complexity. A complexity ontology says, to put it succinctly, that the world is systemic, emergent and contingent. However, most complexity theorists further imply (consciously or otherwise) that the world can be understood as ‘things’ connected by ‘forces’. So they paint a realist picture. What I have come to realise is that, to say something is systemic, emergent and contingent is to say that *whatever* is in the world is connected, and may contribute to the formation of new patterns dependent on history and context. In making an ontological statement about the nature of the world as complex, we do not have to restrict what we consider to be ‘in the world’. So that can include the imaginal, the numinous, the unknowable, the minutiae of detail.<sup>75</sup> It is an holistic view. It is interesting to compare this view with that of Smuts (1999) who coined the term ‘holism’ in his book ‘Holism and Evolution’ written in 1926. Smuts said (1999:94):

‘The idea of wholes and wholeness...covers both inorganic substances and the highest manifestations of the human spirit....

As Holism is a process of creative synthesis, the resulting wholes are not static but dynamic, evolutionary, creative. Hence evolution has an ever-deepening inward spiritual holistic character.’

I think there is strong resonance between my focus on including the imaginal and numinous and Smuts inclusion of the ‘manifestations of the human spirit’ and the ‘inward spiritual holistic character’ of evolution.

And, of course, this idea that the complex world is comprised of matter and psyche (to put it succinctly) is not a new thought on the global intellectual stage, it is just a new thought to me – indeed more than a thought, more a newly-integrated understanding.

Reason and Bradbury (2001), for example, write about this in the introduction to the ‘Handbook of Action Research’. I read this chapter some time before starting on the work described in this chapter and yet this point did not particularly strike me. Years ago I read Berry (1999) and Teilhard de Chardin (1964) and Laszlo (1996) and many others who explore such ideas. And I thought I

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<sup>73</sup> As indicated in footnotes relating to ‘Michael’.

<sup>74</sup> Indeed, this is another example of the developing thinking of the reader. One of the readers of this chapter asked: ‘Do all of our strongest held conceptual and theoretical positions get selected in part by the emotional and psychological dramas that unfold in our lives? Could this discussion of yourself in this chapter then be something of (at least potential) use to others: a guide to them, as to how they need to confront themselves and de-construct their own theoretical beliefs? And that only if and as they do this can they emancipate themselves and gain insight into their world?’

<sup>75</sup> As I discuss in Chapter Six, this was very much the view that Brian Goodwin came to.

understood. But this inquiry has taken these ideas into a different level of knowing for me. I seem to have integrated them, rather than accepted them or considered them at, primarily, an intellectual level.

Reason and Bradbury (2001:8) quote de Quincey (de Quincey 1999:23) as saying 'Matter and psyche always go together – all the way down'. They quote Griffin (Griffin 1998:79) as arguing for 'a form of reality of which mind is a natural part'. Reason (1998:46) says 'Mind and the given cosmos are engaged in a co-creative dance, so that what emerges as reality is the fruit of an interaction of the given cosmos and the way mind engages with it'.

I start to feel hazy again. I read and re-read these statements. I think I get it, I think I understand and then the meaning slips away a little. There is something more I can't quite catch and I imagine it is because I am not yet ready or able to do so.

So I end this chapter with a sense of the start of a new process of inquiry which would take me deeper into this numinous realm – of synchronicity, of the oneness of mind and matter.<sup>76</sup>

### **3.7.5 Postscript**

I return, in summing up this chapter, to the key inquiry question for this thesis, 'is complexity useful. Has complexity been 'useful' to Me in the inquiry I have described in this chapter? Yes it has, in that it has provided a framework, an Other, in relation to which to make sense of Me and my life. And yet, like any framing or Other, my 'entrancement' over many years with Complexity did also, inevitably, narrow my focus. Through giving containment, it had also, inevitably, held me back, in the past, from certain explorations into meaning and identity. By facing the loss of Complexity as Other, the loss of the complexity 'container', as I describe in this chapter, I have been able to reframe and expand its meaning. And through doing this, I have perhaps made it even more useful – both to me and, hopefully, as this informs my behaviour and *modus operandi*, to others.

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<sup>76</sup> I take this haziness into my discussion of complexity as a post-modern science in Chapter Six.

## Chapter 4 What is theory?

### 4.1 Introduction

#### 4.1.1 The questions that underpin this chapter and from where they came

I am interested in how we develop and change the concepts and theories and worldviews we hold. Explorations of the process of theorising are relatively uncommon. Walton (2008), for example, came to this same conclusion in exploring theories about spirituality. She found that theories (in her case, of spirituality) in the literature were theories expressed *either* in abstract terms, independently of experience *or* as theory-free personal spiritual experiences, but rarely did the two come together.

In Chapter Three, I have given an example of how I brought these two threads together: how I explored the abstract *through* detailed experience.

As a result, I came to reframe and broaden my view of what complexity theory can encompass when taken as a worldview. I concluded that the imaginative and the numinous should be part of how we think of a complex world.

This started me questioning what complexity theory *is*. Is it a science that gets taken up as a worldview? Or is it a worldview that gets turned into a form of science? Which of course begs the questions as to what *is* a worldview, what *is* a science, and indeed what is a theory? And these questions beg the question as to how do scientists or theorists or indeed any of us *develop* theories and sciences? Am I typical in the way my ideas developed and changed as described in Chapter Three, or do others work differently?

In this chapter, the main focus is to explore the question as to how people theorise and develop conceptual ideas. I look at the accepted wisdom on the topic and also explore how some well-known scientists and some reflective non-scientists describe their own approach to theory development. I compare their approaches to my own approach. I then summarise what I have discovered about theorising, and, in section 4.5.2, start to consider what this means for helping others to surface and critique their worldviews.

Finally, a question which has emerged for me during the course of this work is how you *research* a systemic, complex, emergent world. This is a poorly-developed area in the complexity literature. I mention this in section 3.1.2, start to consider this question in section 4.5.3, return to it in the final chapter (section 8.8).

The focus of this chapter is on the nature of theorising; then the next chapter will focus on the nature of science. Then, in Chapter Six, building on these reviews of theorising and science, I return to the question of what is complexity.

#### 4.1.2 Methodology

As I exemplified in the last chapter, I want, as far as is possible, in writing this thesis, to be ‘true’ to how this inquiry unfolded, to give the reader an account of what *actually* happened: what I did, in the order in which I did it, what I thought and what I felt. As I have discussed in Chapter Two, this path-dependent narrative approach is consistent with the theory of complexity and the theory of evolution in that these theories emphasise the significance of the *particularity* of the journey and the choices we



make. They emphasise that the way we react to what happens contributes to what creates the outcomes, to what co-creates the future, and to what co-creates meaning and our theories and worldviews. Similarly, the principles of action research, as discussed in Chapter Two, would equally stress the importance of following what *actually* happens rather than imposing, ex ante, a theory or strict methodology which might limit what is investigated, or to what we pay attention, or to what we give prominence. So I want the methods of this thesis to remain congruent with these perspectives as far as possible.

However, endeavouring to follow such a narrative, historical approach creates difficulties for me in this chapter. I have learnt a great deal, through the course of the work for this chapter, about research methodologies, about the philosophy of science, about theories of theorising. Is it really helpful to anyone else to see my relative ignorance turn into relative knowledge and follow my excursions into the literature in an historical fashion, showing what I did first then next? So I have chosen, in this chapter, *not* to write these particular explorations of theory in a narrative, historical way, following my process through time.

The work in this chapter explores the literature on theory development and research methodologies and also explores written accounts of how scientists and others go about theorising, of their own journeys of exploration. I compare these accounts to my own theorising processes.

### **4.1.3 The purpose of exploring the nature of theories and theorising**

Why do I think this question of how we theorise matters? What is the purpose behind this exploration? It is first, as already explained, because I would like to understand how theories are developed, as theory-making will be part of a complexity research methodology in the way it is part of any research methodology and I would like to inform my thinking on this topic.

Secondly, as mentioned in Chapter One, I believe it is important to understand how we develop worldviews and beliefs. Our choice of conceptual ideas about the world, and even, sometimes, the very notion that we indeed hold such ideas, is not always conscious to us – and yet such ideas and worldviews have great power to shape our actions and interpretations. It is easy to hold our worldviews as if they were incontrovertibly ‘true’. For example, some people believe that using reason alone will lead to sensible decisions; others believe we have a destiny that is pre-ordained; yet others believe that men are more intelligent than women. These beliefs drive our choices and actions, our politics and prejudices. Some people believe that certain terrorists are so ‘bad’ and ‘evil’ that they can be killed without compunction, without a trial – as evidenced by the killing of Osama bin Laden. Information of his whereabouts was obtained through torture, his killing required a raid into the territory of another nation and yet his ‘badness’ justified all these actions in the eyes of the perpetrators.

Beliefs such as these are often held by the believers as if they are incontrovertible. I would argue that it is important to be able to help people explore their beliefs, as they clearly have great power to drive behaviour. And as a precursor to working out how best to explore such beliefs, it is useful to understand how beliefs and worldviews develop and get embedded.

So theories and beliefs have power. But what is their basis? It is easy to make unsubstantiated assumptions about the rigour of analysis underlying their derivation, and overestimate their solidity. Some of the axioms and beliefs that underlie the most seemingly rigorous of scientific theories are questionable, to say the least, as I explore in the next chapter. Would exposing the basis of theories



and our reasons for choosing them help people to separate from deeply-held theories and beliefs and see them more objectively? This is part of my exploration.

## **4.2 What is a theory, meta-narrative, worldview, model, concept, idea?**

One of the difficulties in starting to discuss theories is that there are many overlapping words and concepts that sit within this broad camp. There are many types of inner mental processes. I can sit in my chair and return to memories. I can recall events or sequences of events or stories or sensations. I can think about pain – as an abstract term or in terms of particular pain I have or am experiencing. I can think about a meal I ate or recall what someone said. Alternatively I can *reflect* – I can look for linkages or patterns in what has happened; notice, perhaps, how I react to certain situations and find there are some repeated reactions. And I also might start to develop *theories* as to why I – or others – do certain things in certain ways.

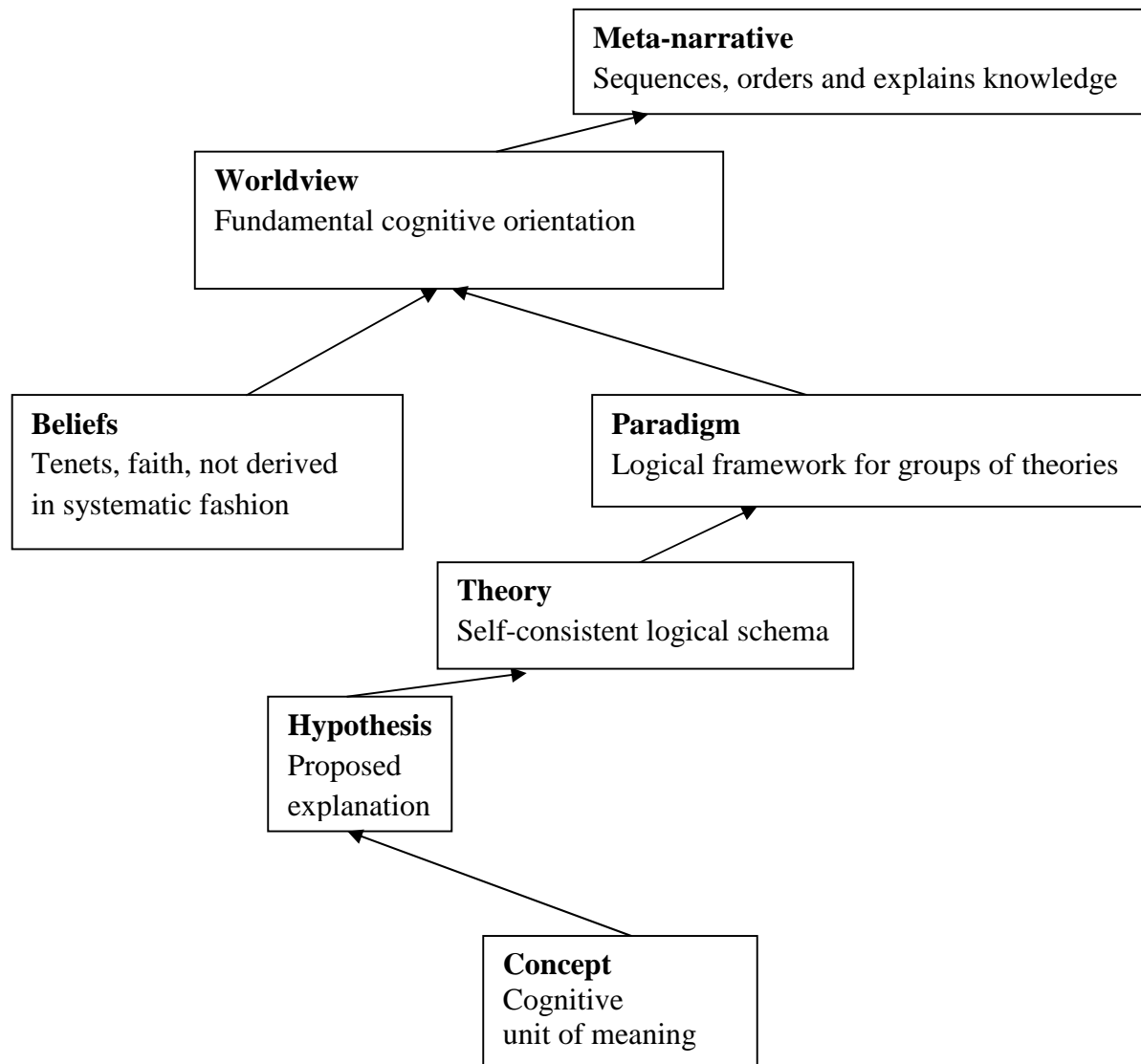
There are many words that are used to describe these inner mental processes and it is perhaps useful to think of these as a hierarchy of terms, as shown in the figure above, where some are building blocks for others. For example, a *concept* is an abstract idea, a cognitive unit of meaning, a ‘unit in terms of which one thinks’ (Gould and Kolb 1964). When we talk of concepts or of approaching something conceptually, then we are describing the way we hold and manipulate mental images and symbols; these concepts may form the building blocks for us to develop hypotheses and theories. A *hypothesis* is a proposed explanation for observed phenomena and, as we gain more evidence or more confidence in its ability to explain or predict, we may start to think of it as a theory.

The word *theory* is derived from the Ancient Greek *theoria*, which means (Case 2012) to look at, observe, behold, consider or speculate. So, according to this description, it was originally used more loosely than the way we use the word nowadays and would have included the idea of reflection and of any form of conceptual thought. Theories, as we use the word now, are analytical tools or self-consistent logical schemas for understanding, explaining, and making predictions about a given subject matter; the nature of this subject matter may be facts and data – information about the ‘real’ world – or theories may analyse ideas and concepts. Theories may be expressed mathematically, symbolically, or be in common language, but are generally expected to follow principles of rational thought or logic. So a theory is a conceptual framework whose purpose is to describe or explain certain phenomena by suggesting patterns or relationships or mechanisms.

Some theories are quite focused as to with what they are concerned; we can have theories that just relate to a specific person – about why someone is always late, for example. Then there are more general theories – about why petrol cars became better established than electric cars, for example. Yet other theories are more universal and apply to more than one type of issue, such as Newton’s mechanics, which, for example, applies equally to interactions of billiard balls or to interactions of the planets – or indeed to any mechanical objects interacting.

There is also *paradigm*, from the Greek *paradeigma*, meaning ‘pattern’. Although initially focused on scientific frameworks, it has come to mean a philosophical or theoretical framework within which other theories and methodologies reside. A paradigm focuses on a set of normative assumptions about scientific ways of thinking and investigating. So the mechanical paradigm, for example, would assume cause-and-effect chains can be defined, that mathematical laws of nature exist, that reason and logic will allow us to investigate scientific problems. A paradigm is essentially logical, subject to reason and focuses on the ways we think about science.

## Hierarchy of theoretical terms



Then there are worldviews and meta-narratives. A *worldview* (Palmer 1996:114) is a ‘fundamental cognitive orientation of an individual or society’, a ‘framework of ideas and beliefs through which an individual interprets the world and interacts with it’. So a worldview is conceptual in nature and can act like a theory in the sense that it purports to explain and can orient action; but its development is less open to the scrutiny of logic or testing. A paradigm would have a narrower breadth than a worldview in that it is more rational, like an overarching theory. A worldview, as well as possibly including scientific orientations and paradigms, may incorporate issues of morals or political orientation or views on equality. It may combine statements about scientific laws with the assertion that God made such laws. A worldview may indeed be illogical or impossible to test or even logically inconsistent. But a worldview incorporates our beliefs, even if we are not conscious of them, and can drive our behaviour and interpretations and can influence what we see as important and on what we

choose to focus. And, as I discovered in Chapter Three, worldviews are often held viscerally, emotionally. Shifting one's worldview evokes loss and other emotional reactions: such shifts of perspective are not just effected by logical discussion.

Finally, there is *meta-narrative*. A meta-narrative (Stephens and McCallum 1998:6) is a 'global or totalizing cultural narrative schema which orders and explains knowledge and experience.' The distinction between worldview and meta-narrative can be seen as one of emphasis. A worldview describes an orientation of understanding, while a meta-narrative has a greater focus on historicity. A meta-narrative is more likely to be in the form of an over-arching story rather than a collection of theories and beliefs.

I include these definitions of terms as an underpinning to the explorations in this and other chapters.

### ***4.3 Methods of developing theories***

#### **4.3.1 Introduction**

In this section I describe the approaches, reported in the literature, of methods of developing theories through undertaking research. In the following section, 4.3.2, I first review the recognised research methodologies – of induction and deduction, retroduction and abduction – which describe approaches used to develop and test theories. In the subsequent section, 4.3.3, I compare these to the methods described by Kolb and Fry (1975) and Heron (1992) who developed, in comparable but differing ways, a schema of the steps in the process connecting 'experience' to 'theorising about experience'. I then go on to explore the work of Mitroff and Kilman (1978) who focus on how in practice our psychological preferences, our personalities, drive the research methods we use and the way we develop theories. And finally, I reflect on what approaches would seem congruent with a complexity worldview.

#### **4.3.2 Defined research methodologies**

##### **Deduction and induction**

The two mainstream traditional research methodologies, as Blaikie (2007), for example, describes in 'Approaches to Social Enquiry', are **deductive** and **inductive** reasoning. Both, as he explains, are linear. The **deductive** approach starts with a theory or hypothesis and then the approach is to work out what can be deduced from such a theory and investigate whether or not the evidence supports what the theory suggests should be found.

The **inductive** method, by contrast, seeks to infer a general theory from rigorously analysing the facts and the data obtained. It starts bottom-up, not top-down.

Both these methodologies are core approaches within the physical and biological sciences as Harré (1972) describes in 'The Philosophies of Science', as well as being core methodologies within social science.

##### **Limitations of induction and deduction**

Both Blaikie (2007) and Harré (1972) are clear that neither of these methods entirely holds in practice. Both, for example, point out that, strictly speaking, deduction should rely on explanations that can be

constructed solely through the language of mathematics and logic, so it excludes any inferences from general theories made by looser or more intuitive means.

With regard to inductive reasoning, Harré (1972) says that what we regard as ‘facts’ depends on what theory we believe. And it can be the case that more than one theory or explanation is consistent with a given set of data. Harré (1972:43) says that, in practice, ‘the growth of science is a leap-frog process of fact accumulation and theoretical advance’. So he suggests we move between theorising, then testing, then developing or modifying our theory in light of the outcomes of the tests, then looking for new evidence or undertaking slightly different tests.

Blaikie, too, emphasises the limitations of inductive and deductive reasoning. With respect to inductive reasoning, for example, he quotes Popper (Blaikie 2007:65) as saying:

‘I do not believe we ever make inductive generalisations in the sense that we start with observations and try to derive our theories from them...at no stage do we begin without a hypothesis, or a prejudice or a problem which in some way *guides* our observations and helps us to select from the innumerable objects of observation which may be of interest’.

Blaikie (2007) also emphasises that the *context* within which the work is conducted has a significant effect. What is deemed appropriate by one’s scientific community? He says (2007:54) ‘social theorists and researchers operate in the context of abstract ontological and epistemological assumptions and these ideas are frequently taken for granted and may not be formulated explicitly’. His comments chime with one of the themes of this thesis: that ideas and beliefs are sometimes taken for granted and not made explicit and yet have a strong impact on behaviour. Context-dependency is also discussed by Foucault (Gutting 2005), and it is central to Kuhn’s (1970) work on how one paradigm can give way to another when one set of assumptions and norms – or indeed worldviews – gives way to another set.

## Retroduction and abduction

Blaikie goes on to describe two other research methodologies: **retroduction** and **abduction**. These approaches respond to the criticisms of linearity and focus on the mathematics and logic that underlie pure deductive and inductive reasoning. **Retroduction** allows for the development of a *model* of the structures and mechanisms that may exist;<sup>77</sup> this model development may come about by any means. Then the implications of the model are compared with empirical testing. If there is congruence, this gives, as Blaikie (2007:83) says, ‘good reason to believe in the existence of these structures and mechanisms’. This is itself questionable in that more than one model may predict the same outcomes. But it is an important point, as much of the work of many complexity people is taken up with model development. How do such models arise and to what extent are they really tested empirically? I return to this in Chapter Six.

Blaikie then describes the **abductive** research strategy. He says (2007:89) ‘it involves constructing theories that are derived from social actors’ language, meanings and accounts in the context of everyday language’. So I would argue that the method I use in of Chapter Three sit within this

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<sup>77</sup> Inductive and deductive methods can also involve the development of models, but such models follow directly from the assumed logic, do not emerge in a more intuitive way.

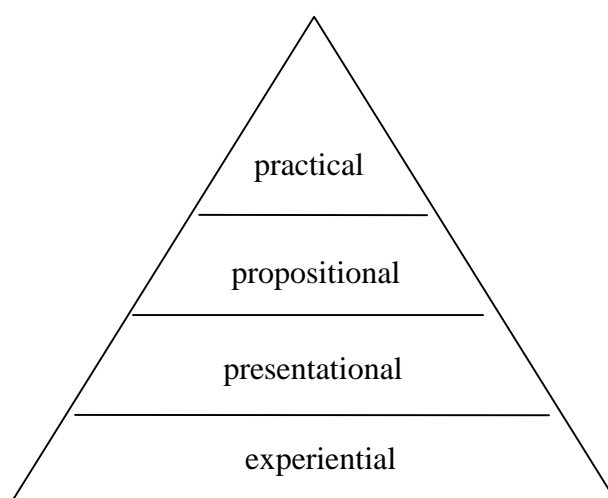
abductive group of strategies. I developed a theory of how we may change our worldview through following the everyday story, in everyday language, of what I did and felt and thought.

Blaikie (2007:90) goes on to say that abduction ‘incorporates the meanings and interpretation, the motives and intentions, which people use in their everyday lives’. He quotes Bhaskar (Blaikie 2007:90) as saying that the ‘relationship between everyday or lay concepts and meanings and social scientific or technical concepts or theories is the central question of method in the social sciences’. Blaikie (2007:91) also comments that this remains ‘a largely neglected area of concern among social theorists and social researchers’. This is an important issue to which I return in section 4.5.3 and again in Chapter Eight. How to develop a research methodology consistent with complexity theory, which explores everyday issues in everyday language, is a key research interest which has developed during the course of writing this thesis.

### 4.3.3 Cyclical and hierarchical theories about theorising; Heron and Kolb

I have, in the previous section, set out the four key classes of research methodologies as described in texts on social science and science approaches to research. There is another group of theories which seek to explore the *stages* in theory development, and explore more explicitly than the generalised approaches in the previous section the *steps* between finding data and creating theories.

One such approach is Heron’s (1992) work on the four ways of knowing. These four ways of knowing are: experiential, presentational, propositional and practical.

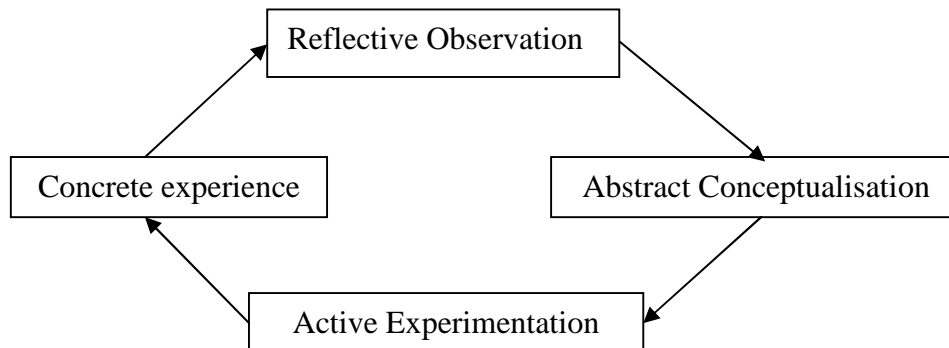


He represents these in a pyramid which suggests, pictorially, that they are distinct processes that happen sequentially, from the bottom up. So his schema suggests you first sense or feel something (experiential), then find a representation for it (presentational), then develop a theory about it (propositional) and then try out the consequences of that theory practically (practical).

The model, engaged with in this straightforward way, implies that these distinct steps follow in logical order and this has resonances with inductive reasoning, as described earlier.

Kolb and Fry (1975) developed a similar model in Kolb’s learning cycle, which focuses on the stages of feeling, perceiving, thinking and behaving which relate to ‘concrete experience’, ‘reflective

observation', 'abstract conceptualisation' and 'active experimentation'. Kolb presents these processes as a cycle and suggests that different people start at different places.



Kolb's schema differs from Heron's schema in that the second stage is 'reflection', compared with Heron's second stage of 'presentational knowing'. 'Presenting' can be seen as a form of, a subset of 'reflecting', a way to start to make sense of the information before developing theories about it.

Kolb's suggestion that different people start in different places means the model incorporates the processes of deductive with inductive reasoning (depending on where you start), albeit with a looser interpretation of deduction than the rigorously logical approach of the scientific theorists. The implication is that you can start with a theory and think what it means for action or you can start with information, reflect on it and develop a theory. Kolb's resonates with that of Wallace (1971) who presents a cycle of theory construction and testing which explicitly includes induction and deduction.

What these representations still imply, however, is that there are distinct steps in the theory-making process. They imply we separately and sequentially go through the processes of sensing, reflecting or presenting, theorising and experimenting.

But is this, in practice, how people go about these processes of theory-building and testing? Do Heron's pyramid or Kolb's learning cycle capture the rawness and complexity of people's process?

Later on in the same book, Heron himself questions whether these simple hierarchical processes are indeed so simple. He introduces (1992:171) the concept of post-linguistic propositional knowing. He says 'instead of seeing the world in terms of the conceptual categories of a logic of contradiction – which separates subject from object, cause from effect, figure from ground, part from whole, process from structure – we view it in terms of categories drawn from a logic of dialectic, in which the opposites interpenetrate'. ....We *participate* in the presence of what there is...we become aware of the *interfusion* of dynamic events in mutual exchanges of informative feedback...we comprehend the contemporaneous *emergence* of components....we respond to the dynamic *gesture* of a thing: the interpenetration of process and structure'.

This description is more in tune with complexity theory in that it emphasises the reflexive nature of interactions – where 'opposites interpenetrate' – and it incorporates the possibility of emergence of new factors. It is a picture of interconnectivity and participation from which new patterns and meaning emerge. It is not a linear picture of separate parts interacting or a sequential process of

exploration. This later work of Heron's implies a much greater interpenetration of the steps in theory-making than his earlier pyramidal model suggests.

#### 4.3.4 Research methods linked to personality type: Mitroff and Kilman

##### Research and Jung's typology

The models of theorising as developed by Kolb and Heron are schemes or processes, derived in a retroductive fashion. That is, they hypothesise a model of the theorising process which can then, in principle, be tested. Another orientation to the understanding of the nature of research methods is to focus on the link between the process an individual chooses to adopt and his or her psychological preferences. This is the approach followed by Mitroff and Kilman (1978) in their book 'Methodological Approaches to Social Science'. Their argument is that our choice of method is driven to a large degree by our psychological preferences. They base their categorisation of personality on Jung's (Von Franz and Hillman 1986) typology, linking it to four distinct approaches to research.

Jung's typology rests on two key dimensions: how we collect information and how we make decisions. Jung suggests that individuals will have a preference for how they take in information – either through sensation (S) or through intuition (N). By intuition, he means the process of seeing patterns and making connections. This is in contrast to sensing, where people work directly with information from the senses. In terms of making decisions, some people have a preference for Thinking (T) and approach information objectively and impersonally whilst others, the Feeling (F) type, have a more personal and values-driven approach to decision-making. This gives four types: ST, NT, NF and SF. The ST represents the archetypal image of the Analytical Scientist, who analyses data and works with it, in a logical, disciplined and objective fashion, to find patterns and structures. This is the classic inductive research methodology. STs are also likely to test theories in a strictly deductive fashion.

ST Analytical Scientist	NT Conceptual Theorist
SF Particular Humanist	NF Conceptual Humanist

Mitroff and Kilman name the NT the Conceptual Theorist. They say (1978:54):

'Whereas the ST fundamentally believes that nature can be partitioned or broken down into divisible, precise factors, the NT believes that nature must be treated holistically and conceptually'.

Mitroff and Kilman go on to suggest that ‘the conceptual theorist (NT) desires to seek out or produce multiple explanations for any phenomena’; that ‘the NT is a speculative theorist who deeply values broad-ranging novel ideas and who does not demand that these ideas be tied down to ‘reality’ in the sense of being verified by accepted theories or facts’ and that ‘the NT believes one should have recourse to many explicitly conflicting paradigms... [paradigms] serve primarily as stimulants to our conceptual imagination’.

So Mitroff and Kilman describe the NT as likely to dialogue between theories in a rather Socratic dialectic fashion, to work *across* the level of propositional knowing in relation to Heron’s pyramid. They are likely to have less interest in facts and ‘reality’ and so would seem less disposed to engage up and down the steps in Heron’s pyramid.

Mitroff and Kilman then describe the approach and focus of the NF (the Conceptual Humanist) and the SF (the Particular Humanist). They suggest that the NF, like the NT, tends to take a dialectic approach to theorising – arguing and contrasting between theories as well as arguing between theorists. Mitroff and Kilman suggest however that the NF is much more concerned with the value and purpose of the work and also places more emphasis on the fact that the scientist or researcher is never objective, but always part of the dynamic and will therefore inevitably influence the process. The NF would seem to be more inclined to methods of cooperative inquiry and would be likely to emphasise the issues of power and purpose when considering how social research is conducted.

Finally, Mitroff and Kilman describe the SF approach and suggest he or she would be inclined to case studies and narratives because (1978:96) ‘the case study focuses on the primary object of the SF’s concern – the in-depth detailed rendering of the life space of a single individual or group’. They go on to say ‘for the SF, all knowledge derives from a personal context’. The SF is less likely to be interested in theories and more interested in what is actually happening in a particular situation.

## **Reflections on this work**

Mitroff and Kilman **do** undertake work researching the *actual* approaches of actual scientists, as I will discuss later. What they do **not** seem to have done, however, is undertake research on scientists who have been classified according to these Jungian types. That is to say their work on typology is theoretical and not based on empirical data, although they do, as I describe in section 4.4.1, undertake empirical research with scientists. So, whilst the conceptual map of personality and associated approaches is undoubtedly of use, it still begs the question, in practice, as to whether individual scientists and researchers fall into these categories. Are NTs never interested in ethics; are all NFs driven by ethical considerations? And, indeed, do NTs contrast theories in a dialectical fashion as suggested, or do they also, or sometimes, follow through a more cyclic process connecting experience and theory along the lines suggested by Kolb’s model? So the question still remains as to how real scientists and researchers do actual research and develop and work with theories.

## ***4.4 Accounts of actual research and of actual researchers and theorists***

Having explored theories of the theorising process, it would seem useful to look for evidence as to how scientists in practice do research and how people, in general, develop theories. So in the next section I investigate accounts of particular scientists, researchers and writers, and I also describe the research undertaken by Mitroff that looks at the behaviours of lunar scientists.



#### **4.4.1 The research by Mitroff on moon-rock scientists**

Mitroff (1977) undertook a four-year study of forty-two scientists studying the Apollo moon rocks. He concluded there are three types of scientists. He describes Type I (Mitroff and Kilmann, 1978:21), the most conceptual, as 'distinguished by their extreme willingness to speculate far afield from known data, or even ignore data when the situation demanded it, in order to construct highly imaginative conceptual theories.... They enjoy finding and creating patterns in disparate data drawn from the most widely scattered scientific fields'.

Type III scientists, he says, have a disdain for speculation and avoid it at any costs. They value precision and fine experimental work above all else. Theories may come and go but good scientific data will last forever' (Mitroff and Kilman 1978:22). Type IIs represent something in between (1978:22) – 'capable of doing good experimental work and of speculating modestly on it'.

He goes on to say that most prestigious scientists in the sample were Type I. They were seen as very committed to their hypotheses and theories and belie the stereotypical portrait of the scientist as unbiased and objective.

Mitroff and Kilman, (1978:28) assert that Type Is are NTs, in Jungian terms, Type IIIs are STs and Type IIs are a mixture of NTs and STs. Feeling types do not figure in Mitroff's sample of scientists, in his view.

I note that, in his description of Type Is, he focuses on how disparate data are used to create imaginative conceptual theories. In his discussion of NTs, summarised in section 4.3, he emphasises the dialectic process NTs engage in between theories; so this seems to be a contradiction. Speaking as an NT, I am more inclined to use the process he describes here – scanning widely for data and constructing a theory creatively built on that data. I do not resonate with his earlier statements (1978:55) that 'the NT believes that one must have recourse to many explicitly conflicting paradigms'. I believe I am more inclined to seek for the most appealing paradigm, the one that encompasses the widest set of data, rather than dialogue between paradigms.

Mitroff and Kilman also describe the work of philosopher Duhem (1954). Duhem asserted that (Mitroff and Kilman 1978:57) 'the scientist never tests a single hypothesis in isolation from other hypotheses but rather against a whole network of background assumptions, auxiliary hypotheses, broad metaphysical concepts, theories and ideas'. Mitroff and Kilman reflect on this assertion in relation to the differences between STs and NTs. They say that STs believe that we can test hypotheses in isolation from one another and hence over time we can distinguish false ideas from true ones, whereas for the NTs the world is always more open-ended and ambiguous.

So I note that Mitroff's work with lunar scientists accords very closely with stereo-typical views of 'hard' scientists – as either conceptual theorists or linear, detail-conscious, somewhat-unimaginative, practical researchers. I was interested to explore how others – scientists and other sorts of theorists and reflective writers – themselves reported on their theorising processes, and indeed how I myself compare with this analysis.

#### **4.4.2 Personal accounts of the development of theories**

I found a number of accounts as to how theorists and scientists describe their own research and theorising processes, which I include as an annex to this chapter, Annex 4.1. These include accounts

of key scientists such as Feynman (Barron, Montuori et al. 1997) and Einstein (1954). I have also included two non-scientists, Marion Milner (1986) and Primo Levi (1989); each is reflective about his experience, and develops theories based on these reflections and observations.

The scientists and writers described in the annex are not ‘typical’, in that they are eminent people who have chosen to write about their methods. Clearly many – if not most – theorists, researchers and scientists do not reflect and write about their styles of theorising. So the sample is without doubt biased, and these examples relate much more to Milner’s Type I scientists – those who are prestigious, rare and outstanding – than to the average. Equally Primo Levi and Marion Milner are perhaps even more atypical examples of theorists; they are reflective and conceptual thinkers, without doubt, but they resist and are suspicious of over-arching theories.

What all the accounts show is that theorising is a personal process; but there are nevertheless some common themes. As described in section A4.1.1, there is the role of the imagination and indeed of the unconscious in the process and the way the imagination can be triggered by play or by making a connection to some chance event. Some theorists, as described in A4.1.2 emphasise doggedness and the all-consuming nature of theorising, an attraction to a particular idea or method or question or theory that is hard to put down until really worked through. And these processes seem as much driven by feeling as they are by rational thought. It may be that the *testing* of theories is analytical, as Einstein suggests, but the *development* of theories is a very different sort of process – dogged, emotional, intuitive, inspired, almost mystical. Goodwin (Brockman 1997) speaks to this same issue. He says, in a talk, ‘The intuitive way of knowing... is a definite way of knowing about the world...All the great scientists, Einstein, Feynman, would say intuition is the way they arrived at their basic insights... the rest of us have to pretend that we’re really basing everything on hard fact, proceeding to generalize by induction.. not seeing a new whole intuitively’.

As described in section A4.1.3, Einstein wrote about looking for patterns in the data out of which to start to create hypotheses. So theory-making can be triggered by seeing patterns *emerge* (rather than looking for expected patterns or outcomes).

Finally, in section A4.1.4 I describe the work of Primo Levi and Marion Milner, who emphasised the importance of staying with the direct experience, staying with the detail, even when this was complex or contradictory. Their work points to the importance of *not* jumping to conclusions, of *not* trying to make facts fit into neat theories. Indeed, like Mitroff and Kilman’s (1978) Particular Humanist, they are suspicious of theories, suspicious of trying to make things overly simple when, perhaps they are not.

## Reflections on my own approach to developing theories and ideas

I was interested in comparing my own approach to theorising with these accounts described in Annex 4.1.

I found a description of my own process of dealing with ideas which seems to resonate with this theme of intuitions and ‘ideas out of nowhere’:

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I was talking about my interest in propositional knowing. That I felt that my own experience of ‘knowing in conceptual terms’ was rich, vivid, juicy; that I quite often found

myself living inside my own inner world very happily and did not always notice I was sitting in a café on my own, or walking on my own as so much was going on in my head. I said that it seemed to be a mixture of sudden intuitions and fully-formed thoughts that came from nowhere, not always or indeed mainly, a logical exploration.

I also found that an initial leap towards a theory can sometimes occur when I am not thinking about the problem of interest and not really ‘working’ at all. Below is an example of grappling with the problem of the meaning of emergence.

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I had been grappling with the meaning of emergence. Some people say that, for example, the quality of wetness is an emergent property of the combining of hydrogen and oxygen as that quality is not present in the constituent ingredients. Complexity thinking would say that that is not emergence as the wetness of water happens in exactly the same way each time; complexity thinking suggests that something is emergent if there is more than one possible outcome and if, were the situation to be repeated, you would not know in a particular case, what would happen. How could I connect these two uses of the word emergence?

I was driving home and it came to me – I was not thinking about it at all – that one is ontological emergence and the other is epistemological emergence. That is to say, what the economy (for example) does next is ontological emergence – it cannot be known in advance even by God. It is an emergent process and there are many options. The fact that hydrogen and oxygen turns into water and that water is wet is emergent in the sense that, if you had not seen it before, you could not have predicted the wetness. But God, who has seen water before (presumably), could have known; wetness is an epistemological issue of knowing rather than an ontological issue of being.

Putting aside the content of this excerpt, 4B, it is interesting to follow how I came to think these thoughts. I find leaving a query half-formed and half-answered and doing something else can often result in a flash of insight. If I can even find small amounts of time to read or write, any dead time – for example sitting waiting for someone – becomes a creative period as it seems to be triggered by the ‘meat’ I have given my unconscious to ‘chew’. So, managing to do even the briefest bits of writing and reading, to keep up the process even in minute amounts, is worthwhile. I often find that ways to structure what I am writing about, or another connection or framing, occur to me in this way. Indeed my physics PhD moved forwards quite often through going to bed absolutely stuck and then waking up in the middle of the night with a new thought, a new way forwards.

Another aspect of my approach to developing theories is that an inquiry is often sparked by something that is said to me about me. I describe at the beginning of Chapter Five, for example, how this inquiry into the nature of science and theorising, which forms the subject of this and the next chapter, was triggered in part by a question to me as to whether I saw myself as a realist. I chose to find the question loaded and the irritation of the question would not leave me until I had worked it through. So my energy for research and inquiry is often triggered and sustained emotionally.

## **4.5 Conclusions and next steps**

### **4.5.1 The learning from this chapter**

What has been the purpose of this chapter? I have sought to bring into question the ways people develop ideas and theories. I have discovered that it is personal, personality-driven, quirky and sometimes even mystical. This exploration shows how individualistic is the way we develop and work with theory. Ideas are often triggered by chance events, such as the spinning of plates in Feynman's story<sup>78</sup>, or by analogies. Sometimes ideas seem to come out of nowhere. Equally, ideas often emerge after carrying around questions for many years; Prigogine (1977) and Darwin (Beer 1986) seem to have worked in this way. And Milner (1986) describes a narrative way of working, paying detailed attention to the minutiae of what happened and what she felt as a result, which provides a very fresh account of working in a narrative way.

It is also interesting to note, as exemplified by Mitroff and Kilman's work described in section 4.3.4, that how we approach theorising, and to what extent we give it weight, is driven by our personality.<sup>79</sup> Whilst I am wary of making assertions about overly-simple classifications, Jung's typology as described by Mitroff and Kilman is helpful in demonstrating that some people are more naturally conceptual thinkers and others are more likely to start with experience.

The discussion in section 4.3.3 and the examples in Annex 4.1 also show that, for many people, there are no distinct steps of data-gathering and theory-making – or indeed of theory-testing in systematic ways. The whole approach is much more intertwined.

### **4.5.2 Working with people to explore theories**

Part of my motivation for undertaking this exploration was to see if understanding how people choose to develop and work with theoretical ideas – from notions of science to deeply-held beliefs and worldviews – would help in deciding how to help people explore their own ideas and beliefs. What I take from this work is that ways of exploring beliefs need to be multi-faceted and pluralistic; different approaches will be useful for different people. Reason alone will not change people's views. As I discussed at the end of Chapter Three, we are attached to our worldviews and can experience feelings of loss and loss of meaning as we begin to change them. And the role of feeling, of emotion in worldviews is brought home strongly when looking at the reasons for climate change denial, as I commented in Chapter Three. I also find, in Chapter Seven, during the complexity inquiry process described there, that my own tendency to want to theorise, to work with abstract ideas, is not always helpful to everyone. People often change their ideas through measuring them against stories of their own experience, as I explore in that chapter. So my explorations in this chapter set the scene for further work into methods to help people inquire into the theories and beliefs they hold and this has influenced how I engage with groups on this topic.

For example, in designing teaching and inquiry into worldviews, I use a variety of approaches to reflect the multiplicity of learning styles and personality preferences. For some there needs to be a logical chain of evidence and I present the development of worldviews historically, starting with the

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<sup>78</sup> Described in section A4.1.1.

<sup>79</sup> And this raises the question as to whether complexity appeals to me because I hold an NT preference? Another question for future consideration.

pre-Socratic philosophers and Eastern mystical traditions. And I show how the ideas of complexity emerged out of an attempt by physicists to understand evolution.

For others there needs to be an opportunity to experience how different people have different worldviews and I do this by splitting the group along the lines of Jung's typology and asking people to explore a simple question – such as 'how do you make strategies successful?' Each of the four groups typically answers in very different ways, as summarised in the table below. This is very reflective of Mitroff and Kilman's (1978) model discussed in section 4.3.4.

ST  Structured Logical Linear Unambiguous	SF  Clarifies 'important' detail Personal Impact on people Issues driven
NT  Visionary Allows freedom Conceptual and creative	NF  Values 'important' things Motivational Broad not detailed

This exercise, more than many others, never fails to silence the group, as they come to terms with the extent to which our theories about the world are driven by our personalities, driven by what makes us comfortable, what seems normal to us.

I also give many examples and stories to try to bring alive the nature of a complexity worldview and give, increasingly, time for discussion and reflection.

How best to work with groups to raise awareness of beliefs and worldviews is an ongoing inquiry strengthened by the work of this thesis, particularly of Chapter Seven, and I return to this in Chapter Eight.

### 4.5.3 Further thoughts on theorising: developing and testing hypotheses

The work in this chapter has focused in particular on theory development, on ideas generation. What I have not paid attention to is the ways people *test* theories, or the ways people iterate between hypothesising and seeking evidence. Do they look for logical consistency between elements of theory in an abstract fashion or is their attention primarily on comparing the predictions of a theory with what happens in the 'real world'. How is this done and how can it be done well? What we see and how we choose to interpret it is so personal, as shown by the next example.

#### 4C Reflections after attending a conference, December 2010

I was at a conference recently listening to some work on how a number of people in their fifties coped with redundancy. The speaker was referring to a particular woman who the research group had felt was an example of ‘chaos’, one of the categories they had developed to classify the ways people handled redundancy. They felt she had lost the energy to find a new job and had fallen apart and fallen from view. They spoke of her in sad terms, as a failure. A number of us reading the account of what she had said (most of us women in our fifties) had come to a very different conclusion. Here was a woman who had ceased to measure herself by the measures of the young (and perhaps the measures of men), by the need to have a job. She had decided to reinvent herself, find new ways of finding meaning and living other than through mainstream work. We saw her as a success, able to leave the world of work and find other ways to live. So the research group’s subjective perspective seemed at odds with our subjective perspective.

Clearly this issue of how to form hypotheses from data is not a new concern, and action researchers and other qualitative researchers pay attention to showing quality in research which includes the need to demonstrate that there are enough people contributing to and commenting on the research (including the participants) that such potential prejudices are flushed out. This issue is an important one in working with complex situations where there are multiple perspectives both on what is happening and how to interpret it.

But I am also reaching to say more than this. What can we say about the process of hypothesising, of reaching tentative conclusions as we look at data and try to shape the next stage of research? Can we say anything? The work in this chapter probably suggests not – indeed the work of this chapter concludes and evidences that hypotheses often arrive fully-formed whilst our attention is elsewhere.

But is there a difference in testing a hypothesis that arrives out of the ether (a loose sort of deductive process) and teasing an hypothesis out of data (a loose inductive process). And Einstein (1954:221) says<sup>80</sup> of this latter process, ‘the scientist has to worm these general principles out of nature by perceiving in comprehensive complexes of empirical facts certain general features which permit of precise formulation.’ So why am I worrying?

But, as at the end of Chapter Three, I feel I am reaching for something more. If research pays great attention as to how we gather knowledge – in an unfettered, emergent fashion if we are working within a complexity worldview – we need to pay equal attention as to how we hypothesise about what that data suggests and how we further test and refine that hypothesis. There is something more to grapple with here and I return to these ideas, about how to develop a complexity-framed social research methodology, in the final chapter, in section 8.8.

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<sup>80</sup> And I consider in section A4.1.3.

## ***Annex 4.1 How scientists and theorists describe their individual approaches to developing theories***

This annex contains the information on which I based the conclusions described in section 4.4 on how scientists and other theorists themselves discuss their individual approaches to theorising. The information has been taken from personal accounts. I have grouped the accounts under various headings which capture the essence of the approach to theorising.

### **A4.1.1 Ideas triggered imaginally and through play**

Einstein, in answer to questions as to what internal images or thoughts or words he made use of as a mathematician, stated (Einstein 1954:25):

‘The words or the language...do not seem to play any role in my mechanism of thought. The psychical entities which seem to serve as elements in thought are certain signs and more or less clear images which can be ‘voluntarily’ reproduced and combined.... The above-mentioned elements are, in my case, of visual and some of muscular type.’

So, interestingly, even one of the most theoretical, the most mathematically competent of scientists works with images and with elements of ‘muscular’ type – presumably a sort of bodily, visceral sense.

Harré (1972:23) supports this example of the use of the imagination. He says ‘causal mechanisms are not discovered initially by observation....[but] *first imagined*, and their attributes are derived by analogy with entities already known.’

I found other examples of the importance of playing, of use of the imagination. Kary Mullis (Barron et al 1997:68), a molecular biologist, talks about his work on DNA thus:

‘I wasn’t developing a way to amplify DNA at all. It was like I was randomly putting Tinkertoys together and finally made a structure and said, ‘You know what. If I turn this toy wheel over there, the damn thing would wind string’....Moving between fields is the way to be creative. Keep your fingers in lots of pies. I do it because I am curious’.

Richard Feynman (Barron et al 1997:67), a very well-respected Nobel-prize-winning physicist, describes his working process as:

‘Some guy, fooling around, throws a plate in the air and I notice the red medallion of Cornell went around faster than the wobbling.... I start to figure out the motion... I had made up my mind I was going to enjoy physics and do what I liked..... It was effortless. It was easy to play with these things. Everything flowed out effortlessly....The diagrams and the whole business I got the Nobel Prize for came from that piddling about with the wobbling plate’.

### **A4.1.2 Consumed by it**

I found a number of examples of scientists discussing the way they were ‘consumed’ by their work, had strong emotions related to it.

Jamison (2004:181) quotes Sinclair Lewis in ‘Arrowsmith’ thus:

‘Martin had one characteristic without which there can be no science. He had a wide-ranging, sniffing, snuffling, undignified, un-self-dramatising curiosity’.

And Darwin (Jamison 2004:181) said: ‘The joy I felt...was so excessive that I sometimes found myself in a kind of reverie... I had strong and diversified tastes, much zeal for whatever interested me and a keen pleasure in understanding any complex subject or thing.’ And theoretical physicist, Alan Lightman (Jamison 2004:185) said: ‘I miss the intensity. I miss being grabbed by a science problem so that I could think of nothing else, consumed by it during the day and then through the night.’

Mitroff (Mitroff and Kilman 1978:22) equally talks about the way his elite, Type I, scientists were obstinate, ‘highly partisan advocates of the theories they are developing.’ They did not easily let go of their position. Although he does not say so, this description portrays Type Is as highly emotional, not as objective, apersonal decision-makers as NTs<sup>81</sup> are generally described (Myers 1994).

### **A4.1.3 Patterns emerging**

Einstein describes the process of the theoretical physicist (Einstein 1973:221). He says the work of the theoretical physicist falls into two parts. The second, he says, is the easiest – from developed *principles* the physicist draws conclusions and predicts outcomes in a deductive manner. But the first part, deriving the *principles*, is much more intuitive, he says:

‘Here there is no method capable of being learned and systematically applied so that it leads to the goal. The scientist has to worm these general principles out of nature by perceiving in comprehensive complexes of empirical facts certain general features which permit of precise formulation.’

Einstein is emphasising, once again, the role of intuition but is also emphasising that scientists need to – and do – find patterns in the data. And that identification of such patterns does not come through any established pre-defined analytical methods but through ‘worming’ them out.

### **A4.1.4 Remain with the complexity, the direct experience of it**

Another type of approach to theorising seems congruent with the ‘feeling’ approach of the SF, the Particular Humanist, described by Jung, where the focus is on staying with the complexity and the narrative integrity of the issue and resisting the temptation of simplifying into simple explanations. Primo Levi, for example, in ‘The Drowned and the Saved’ (Levi, 1988) reflects on his experiences in Auschwitz. In his chapter on ‘the grey zone’, he reflects on the grey – not easily-discussable – issues of collaboration with the Nazis and persecution of prisoner by prisoner. He says (1988:22) ‘what we commonly mean by ‘understand’ coincides with ‘simplify’” and he rejects this approach. He goes on to say (1988:23) ‘the *desire* for simplification is justified, but the same does not always apply to simplification itself. It is a working hypothesis, useful so long as it is not mistaken for reality; the greater part of historical and natural phenomena is not simple.’

He gives an example in the story of a Rumkowski, a Jewish collaborator in Auschwitz. He says, of this story (1988:48), ‘A story like this is not self-enclosed. It is pregnant, full of significance, asks more questions than it answers, sums up in itself the entire theme of the grey zone [this is the grey area of collaborators in Auschwitz and violence from prisoner to prisoner] and leaves one dangling. It

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<sup>81</sup> Description of the four Jungian classifications of personality types is given in section 4.5.2.



shouts and clamours to be understood, because in it one perceives a symbol, as in dreams and the signs of heaven.'

So in his accounts of Auschwitz and his desire to understand what happened and theorise about it, Levi is grappling with the fact that there are no simple explanations or theories; the issues are complex, grey, full of feeling and symbolic meaning.

A not dis-similar example of such an exploration is the book 'A Life of One's Own' written by Marion Milner in 1934 (Milner 1986). In this book she tries to understand how she thinks, feels and acts through watching the minutiae of her thoughts, dreams, drawings, feelings and actions.

In the book, she writes about her views of the methods of traditional science and contrasts this with her own approach to finding what is 'true'. She says (Milner, 1986:200):

'One warm summer evening, steaming out of London on a week-end train, I caught a glimpse of a fat old woman in apron and rolled sleeves surveying her grimy back garden from the door-step. At once I was seized with the impulse to know more about her... It was only later, when I read that science is concerned, not with individuals but only with specimens that I began to realise why I could not find what I wanted in science. For it seemed to be just the qualities of particular experiences which I wanted. When I considered anything that happened to me in terms of science, I had to split it up into parts and think only of those qualities which it had in common with others, so it lost that unique quality which it had as a whole, the 'thing-in-itself-ness' which had so delighted me in wide perceiving.'

Her experience, like the SF<sup>82</sup> type described by Mitroff, distrusts the desire to generalise and trusts that the insight is within direct and detailed personal experience. She also sees science in the traditional way, the way STs see it. She goes on to say (1986:202):

'I wanted to keep rigidly within the bounds of my own actual observation, to forget everything I had read, everything I had been told, and to assume nothing that did not emerge out of my own direct experience.'

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<sup>82</sup> See section 4.5.2 for an explanation of the terms SF and ST.

## Chapter 5 What is science?

### 5.1 Introduction

#### 5.1.1 The impetus behind this question

In Chapter Four, I have explored theories about theorising and compared them with how people describe their personal approaches. Although many of these methods and processes relate to science, I have not considered the nature of science *per se*. This has become an important question for me as it forms the backdrop for exploring what complexity theory is. Is complexity theory indeed a science? And to consider that I need to consider what *is* science.

The impetus behind the inquiry comes from two directions. First, a personal one: I trained as a physicist and spent the first several years of my working career in science and engineering. Early on, in the Diploma phase of the work of this thesis, someone asked me if I was a realist. I chose to hear this in an unfavourable light. In social science circles (or for that matter, in social circles) I sometimes feel that I am projected onto as a scientist, that people imagine that having been trained as a scientist means that I approach everything in a rational, logical, objective fashion, that I believe science answers every question, that I see things in black-and-white, right-and-wrong terms. This piques me; it made me want to explore the way scientists work, as described in the previous chapter, and show their creativity and use of the imagination. And it created an impetus to explore what science is. And, indeed, to explore in more detail what realism is and whether, indeed, I *am* a realist.

Secondly, as I have already said, there is the question of complexity theory. Is this a science? If so, how does it relate to what is regarded as ‘normal’ science? And, building on the work of Chapter Three, how wide can the boundaries of science go before we would conclude that something is not science?

#### 5.1.2 A note on methodology

The first part of this chapter explores the nature of science through reviewing and critiquing the literature. It also builds on my own background as a scientist, so the basis of these ideas is not new to me, although, as I say later, ontological questions as to the nature of science did not form part of undergraduate – or even postgraduate – work in science.

The second part of this chapter, section 5.4, uses a personal learning history approach as described in Chapter Two and exemplified in Chapter Three. I tell the story of an event that happened over a few months where I was thinking a great deal about the way complexity theory is a science. As well as telling the story, the narrative of this exploration, I also consider what I have learnt through doing this – about the effectiveness of the narrative method, about complexity theory, about science.

### 5.2 What is ‘normal’ science?

#### 5.2.1 Positivism and realism

Harré (1972), in ‘The Philosophies of Science’ explores, amongst other things, the methodologies used to develop scientific theories. He asserts in the preface (Harré 1972:preface) that the two poles of scientific methodologies are positivism and realism and that, in his view, ‘the case for realism...is overwhelming’. With a positivist approach, the theory is derived using strict deductive logic. Things

follow exactly; there is no *inferring* that if something is shown to hold in many experiments then it is likely to hold universally; and the form of the theory is generally mathematical. So this leads to the strictest definition of science, as exemplified by the laws of physics. This can be summarised as follows.

The laws of positivist science are:

- True, for their regime of validity. That is to say, there have never been repeatable, contradicting observations
- Universal. They appear to apply (within their regime of validity) everywhere in the universe
- Simple. They are typically expressed in terms of mathematical equations
- Absolute. Nothing in the universe appears to affect them
- Stable. They remain unchanged since they were first discovered (although they may have been shown to be approximations of more accurate laws)
- Deterministic. The future is predicted from the past in smooth fashion<sup>83</sup>.

It is interesting to note that ‘testable’ is not included in this list. Einstein’s theory of relativity was regarded as science long before it was possible to gain any evidence to support it (through Eddington’s work on a solar eclipse in 1918).

Newton’s laws of mechanics are usually regarded as a good example of a positivist science in this strictest sense. They seem to satisfy all of the criteria above<sup>84</sup>.

How does positivism compare to a realist position on science? Realism is a weaker position than positivism, in that it does not depend necessarily on laws defined in mathematical or logical terms. But realist statements are still expected to be true and universal and stable. The strictly realist<sup>85</sup> position is that the world described by science is the real world and is objectively the case; it does not depend on our point of view, it is not a construction. Scientific statements are either true or false, not a matter of opinion, and many of the entities referred to in a scientific theory do exist in the real world, are not just abstractions.

To elucidate the difference between positivism and realism in relation to science, Harré (1972) compares Newton’s laws of motion to theories about viruses. Newton’s laws describe how planets move or perfect volume-less billiard balls knock into each other, but we do not know what a force or what gravity really are. And indeed there could be other ways of attributing physical explanations to the mathematics which could also be plausible. Harré says (1972:180) that, for positivism, ‘the function of the force concept is easily seen to be pragmatic, serving only to enlist intuition in the understanding of certain abstract relations.’ In other words, it helps us to think about a force and put a picture and sense to the mathematics, but that is all, in the end, that it is – a pictorial representation to help us think about situations without always returning to the maths.

In contrast, realism, Harré argues, focuses on real things in the real world. So theories about viruses do not necessarily transfer to other domains (such as rabbits or economies); and viruses, unlike gravitational forces, *do* incontrovertibly exist. Harré says (1972:181) ‘the virus theory of disease

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<sup>83</sup> And this implies time-reversibility; if time were reversible you wouldn’t be able to tell the difference between a film going forwards or going backwards (which of course, in general, is not the case!)

<sup>84</sup> Although I will bring this into question in the next section.

<sup>85</sup> As I explore in section 6.4, there are many shades of realism in the social science literature, whereas the science literature is less broadly based.

introduces an entity which was unobservable when first introduced, and which is supposed to cause the observed phenomena, but which cannot be eliminated from the theory without entailing a radically different concept of illness, cure, and so on.' In other words, you can't have a theory that links disease to viruses without asserting that viruses exist. In contrast, the mathematical description of the way planets go around each other will still work even if the notions of force and gravity are ignored or disproved.

### 5.2.2 The less obvious (and problematic) features of Newton's mechanics

Of these two sorts of science, positivism and realism, I first want to focus on the positivist, universal, scientific-law sort of science as it is theories within this class, such as Newton's mechanics, or equilibrium thermodynamics, that tend to get taken up as meta-theories or worldviews and hence are given a wider applicability than that for which they were intended<sup>86</sup>. I want to show the holes, the lacunae in these theories of science, even within the domain for which they were developed. To see the lacunae in such theories means they can lose some of their power when used as theories of everything, as worldviews.

When I learned physics at school and university, there was no teaching of the history of science or the controversies surrounding particular theories. The focus was on understanding the theory *per se* and on being able to handle the related mathematical equations. Examination questions focused on solving mathematical problems and on explaining the accepted explanations – of gravity, of atomic structure, of electrodynamics. There was no discussion about disagreements amongst scientists or about the limits to science. So it was not until much later that I became interested in understanding the history, the dilemmas, the hidden assumptions on which science can be based. This is not to take an anti-science stance, but, as with any other bodies of thought, it has emphasised to me the importance of questioning the premises on which theories and explanations are based and recognising the dangers in abstracting universal laws out of more prosaic and constrained bodies of evidence.

With this in mind, how can we approach Newton's mechanics and reflect on the fact that it has been used as an underpinning for the French (but not the Scottish) Enlightenment and has legitimated and framed the modern era – the focus on design, prediction, measurement and control which dominates much of management theory, economic policy, not to mention medical practice and most scientific methodologies.

What are the limitations to Newton's mechanics? I have already discussed the fact that mathematically-based laws like Newton's mechanics, whilst they seem the most rational of all sciences, still can only infer or *imagine* what the physical qualities like force or gravity really are. The same is true for electromagnetism, quantum mechanics and so on. What is a quantum? What is an electromagnetic field? We know some things about what they predict that are testable but we can only *imagine* what they are, if indeed they exist at all.

Secondly, theories such as Newton's mechanics are based on axioms. An axiom is a proposition that is not proven or demonstrated but is considered to be self-evident and true. Newton's laws need a frame of reference so that motion is seen in relation to this frame of reference. But if you want the laws to apply to the whole universe, you have to assume, axiomatically, the notions of absolute space and absolute time. So that implies the universe has a centre, a spatial orientation (i.e. which way is up,

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<sup>86</sup> Newton's mechanics underpins traditional management theories – of budgeting, planning, market research; equilibrium thermodynamics underpins classical economics.

which way is left) and was started off at time zero. But in order to make these assertions you would need to reference them to some wider frame – left or right in relation to what? But what can be wider than the universe? When challenged on this at the time by Leibniz, Newton (1730) said that God decided – on when the universe started, on which way up it is. So the most important point in this story is that what is regarded as *the most* scientific and rational of sciences, an exemplar for all other scientific endeavours, is based on what God did and on non-obvious axiomatic assumptions without which the theory becomes much more limited.

Thirdly, Newton's laws were not really connected with experiment. As Toulmin (1990:104) says: 'The New Science was meant to be both 'mathematical and experimental' but it was left unclear how these...dovetailed....Descartes and Newton set out to build mathematical structures and looked to science for theological not technological dividends.' And, of course, these mathematical structures are approximations to the actual planetary motion as shown both by relativity and by more sophisticated approaches to solving the mechanical equations.

Fourthly, Newton's laws only explain *some* of the phenomena of the universe. They cannot explain for example why the solar system is flat or the *particularity* of the detail of the universe – its particular structure of galaxies and planets and systems. When challenged, Newton, speaking of the flatness of the solar system, said that God periodically patted it back into place<sup>87</sup>. Leibniz (Parkinson 1973) and more recently cosmologist Lee Smolin (1997) emphasised that Newton's laws have nothing to say about the fact that the universe is so contextual, so un-uniform. As Smolin (1997) says, it is such an obvious point we somehow do not notice its importance.

The limitations of Newtonian science have been written about many times (e.g. Kuhn (1970), Toulmin (2001), Smolin (1997)) but I include a discussion here because Newton's science has, more than any other science, been adopted as a worldview – a view of the world as a machine which can be understood, dissected, predicted and controlled. I want to emphasise that Newton's theories are in practice limited to certain problems, limited in accuracy even for those problems, and are based on questionable assertions.

### **5.3 So what is science?**

Clearly the example in the previous section shows that science is not as rigid or rigorous as is commonly imagined, so what makes something scientific rather than not scientific?

#### **5.3.1 Even the physical realm does not necessarily obey the 'laws of science'**

As discussed in the previous section, there are commonly-defined attributes of science – universality, objectivity, determinism. But even within the physical sciences, science does not always accord with these criteria. Many interactions are non-linear and synergistic and this affects the predictability and repeatability of experiments. That is to say it is not possible to isolate the effect of one input on one element of the system from another as inputs work synergistically; if two inputs come together, for example, the outcome will not just be the addition of what would have happened if each occurred separately. For the same reason, outcomes can depend on the order in which things happened. So the understanding of the self-organising patterns, stripes and swirls found in liquids described by Prigogine (Prigogine and Stengers 1984) sits within the realm of science even though these are not deterministic. The forces can be measured and modelled; the nature of the patterns can be measured

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<sup>87</sup> According to mathematical physicist Professor Chris Clarke who told me this story.

objectively, a theory of their emergence would be universal and objective – but the particular *form* of the patterns will differ each time the experiment is run.

The same issue – of indeterminism – is the case for climate change models. Climate change modelling is scientific in that it uses objectively-measured relationships between factors – how ice reflects back sunlight, for example. The science of the greenhouse effect, for example, is well understood. But the situations are complex and many factors can become important – such as how greenhouse gases are released from the permafrost as the ice melts. It is not possible to know all of the factors that are, or may become, important. So the models are constantly updated as new information is uncovered and new interactions gain relevance. The approach *is* scientific, but the predictability of the outcomes is more limited than when exploring simple problems.

The science of evolution is another example which does not fit with the strictest definitions of science. The principle of evolution as expressed by Darwin – variation followed by selection – is a universal theory, expected to apply universally to all living things. But how can you catch it happening; how can you know in the moment whether a variation in a plant or animal will fit the prevailing conditions and emerge into a new species or new ecology; was it just a temporary wobble? It is not easily testable as a theory. If every situation is different, how can we be sure about the posited underlying processes?

Prigogine was very interesting on the subject of what constitutes science. He pointed out (Prigogine 1975) that (a) the universe is not closed, so any conclusions based on the idea that it is<sup>88</sup> are questionable, and (Prigogine 1996) (b) we know from our experience that the world *is* irreversible, that the ‘arrow of time’ exists, so we know the world is not deterministic and hence deterministic science must be flawed. The idea of time-reversibility, implicit in all deterministic science (which indeed is almost all of what is deemed to be science) ‘contradicts outright everything we see around us,’ as Prigogine (1996:40) said. As he stated, it is obvious that we and the world around us get older; it is obvious that we cannot return situations to an earlier time. Yet deterministic science acts as if there is no difference between the past and the future. Prigogine is emphasising one of the unspoken flaws in the basis of traditional deterministic science.

### **5.3.2 The boundaries of science: a social construction?**

So where are the boundaries of science? What about the study of dreams? As I discussed in Chapter Three (section 3.3.1), a strong interest of mine for twenty years or so has been Jungian psychology. Jung trained with Freud and his work is a development of Freud’s psychoanalysis (Jung 1963). Jung’s approach is predicated on the notion that everyone is different and the task of the analyst is to help people find their own sense of themselves, their own sense of meaning; in contrast Freud’s approach centres more on the notion that people need to be helped to become ‘normal’. So some would argue that Freud’s theories are more scientific in that they posit simple mechanisms (for example, the Oedipus complex) to understand human drives and neuroses and posit ways to uncover and heal these so that people can become ‘normal’. Jung’s tradition, which focuses on the uniqueness of each individual, can seem less scientific in that there is more of a ‘try it and see’ approach and he expects every situation to be driven by different factors.

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<sup>88</sup> So, for example, the statement that entropy (disorder) increases over time for the universe as a whole depends on the universe being a closed system.

One of Jung's group, Marie-Louise von Franz, in the same way as Jung, worked with people primarily through analysing their dreams<sup>89</sup>. Her work is rigorous and she applies a logical and analytical and self-consistent approach to her work. But is this science? One test as to whether something is scientific is that an experiment can be repeated by someone else. The dreams were written down, so it would be possible to see if someone else would interpret the dreams in similar fashion. Dreams can be remembered and recorded; they are as real as feelings or sensations such as pain. And indeed neuroscience<sup>90</sup> is now getting involved in exploring what the brain does when people dream, whether there are different types of dreams at different stages of sleep. So, just because the subject matter of dreams is not objective and 'real', cannot their analysis be regarded as scientific?

To take another example, would action research be regarded as scientific? One could argue that action research is indeed *more* scientific than the application of reductionist cause-and-effect 'scientific' methods to social problems, in that it mirrors the complexity and contingency of the real world; it is not artificial and does not impose *ex ante* a theory as to what is affected by what or what is important to address. But action research methodologies can require a critical subjectivity in deciding what is there and how one makes sense of it. Does this requirement for subjectivity mean the work is not scientific?

Perhaps the test of *subjectivity* differentiates science from non-science? But, even if that were the case, how do we define subjectivity? Kuhn's (1970) work on paradigm shifts shows that context and who holds the dominant discourse affects our views of what is regarded as science and what is not. Certain types of evidence are allowed; certain anomalies – or the need for certain axioms – are ignored. So theories of multiverses are deemed scientific, despite the paucity of evidence for their existence. And detailed recording of the existence of planets is deemed scientific because it is repeatable and systematic even if no theory is derived from the recordings. What is defined as scientific is to some extent subjective, a matter of convention – indeed, a social construction.

Prigogine made a similar point (Prigogine, 1996:39):

'Science is the expression of a culture. Its boundaries are hard to define. It refers to a dialogue with nature. But nature is not a given; it implies a construction in which we take part.'

He goes on to say (Prigogine, 1996:41), 'science is a dialogue between man and nature: a dialogue not a soliloquy. Indeed science is part of that search for the transcendental that is common to so many cultural activities: art, music science.'

He captures the fact that science is socially constructed and he also captures the sense of science as a 'dialogue with nature' which fits very well with Reason's (2001:2) 'participatory worldview'.

Brian Goodwin was very aware of the issue of subjectivity in science. He worked to develop a science of qualities, based on a more intuitive way of knowing. And he positioned this subjectivity as *within* science not *outwith* science. He says, in an interview, (Brockman 1997):

'We experience more than quantities; we also experience qualities such as colour, texture, pain, health, beauty, coherence. Science tends to dismiss these as 'subjective'... Subjectivity is getting

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<sup>89</sup> As discussed in Chapter Three.

<sup>90</sup> As reported in New Scientist (2011)

squeezed out by science... I believe there is a whole scientific methodology that needs to be developed on the basis of what is called the intuitive way of knowing.'

So Goodwin (2007) wanted to extend the definition of science to allow for qualitative, intuitive and subjective factors. There is a link here with the exploration of the inclusion of the 'unknowable' and the numinous within complexity theory discussed in Chapter Three. Can science embrace these aspects of our world? Heron explores this issue in his book 'Sacred Science' (Heron 1998). And Heron (1998:8) cites an article by Peter Reason (1993) in which, Heron says, Reason 'argues that a secular science is inadequate for our times and points to the pressing need to resacralise our experience of ourselves and our world' and include love, beauty and wisdom. Goodwin was also very clear that science is socially constructed. He said, in an interview with Brockman, (Brockman 1997):<sup>91</sup>

'Scientists virtually all agree that there's a real world that's being investigated by science. But science itself, and the tools of science, are social constructs. The knowledge you get from science is real knowledge about the real world. .. So there's this strong element of social construction in science, but I am not a relativist.'

### **5.3.3 Boundaries of science – appropriate for the situation**

So what is science and what is scientific is perhaps a continuum. We have continually to ask if the method is appropriate for the situation. Using the mathematics of equilibrium thermodynamics to explore open complex economic problems does not make the approach scientific if the theory and consequent methodology is not appropriate for the problem. We must ask about evidence and repeatability and rigour. And uncover the subjective elements in even the seemingly 'hardest' and most objective of approaches. I would argue that telling a detailed story of a complex situation may indeed be scientific if it is rigorous and thorough. And if most situations are indeed complex, then it is more scientific to reflect this in the methodology than to shoe-horn the problem into a neat deterministic simplified frame. Developing universal theories and over-extending their application – or artificially limiting the variation in the experiment so that systemic factors are excluded – may indeed be unscientific, even though both of these are common practice.

Discussing the nature of science is clearly a huge topic and I only touch on it here. But this inquiry has been important to me in reflecting on the differences between so-called 'hard science' and social science and in setting the frame for reflecting on the nature of complexity theory in Chapter Six.<sup>92</sup>

## ***5.4 Narrative as science, science as narrative***

### **5.4.1 Introduction**

The work in this chapter has explored what is the nature of science and has shown that what science is, at least to some extent, is a judgement, a convention.

Having discussed this topic through addressing and critiquing the literature, in this section, I return to a personal learning history approach. I follow the story of how I came to consider whether complexity theory is a science and conclude it is a form of post-modern science.

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<sup>91</sup> An extended version of this quote is discussed in section 6.5.1.

<sup>92</sup> I don't discuss here the issue of dealing with human systems as opposed to inanimate objects or natural systems. This is raised in Chapter Seven and again in section 8.5 and is (obviously) an important issue.



I want to show how this exploration evolved over a period of time, what contributed to it, how my ideas emerged. I want to do it in this way for a number of reasons. First I want to ask if a narrative approach can be deemed scientific. As I discuss below<sup>93</sup>, Darwin wrote ‘The Origin’ as a narrative, as an account of what he did, what he thought, how that affected his choices of experiments and development of hypotheses. He included his uncertainties and the blind alleys he followed. His approach indeed mirrors the nature of evolution itself, in that there is a particularity, a path-dependent history, to what evolves, what emerges. If we look at an averaged-out, tidied-up version of evolutionary history, we are likely to miss the very details and factors that led to the outcomes that emerged.

So, if I follow a narrative approach, do I learn something different by following closely what I did, what I thought, how I shifted ideas? If I tell my own exploration of the connection between science and story *as* a story, do I learn something about how my own theorising about science is emerging? The alternative would be to tell it as a post-rationalised, tidied-up account where I might seek (perhaps) to present certain conclusions and show how the data and analysis support them; a method which mirrors the dominant paradigm of certainty and causality.

Secondly, this account gives another example, like the example of Chapter Three, of how I theorise, how I hold and develop conceptual ideas. So it gives a personal example of an approach to theorising to compare with the theories of theorising discussed in the previous chapter.

Thirdly, I can consider whether this narrative approach would form part of the complexity methodology which I am interested in developing and discussed in section 4.5.3 of the previous chapter.

## **5.4.2 The story of developing the idea of complexity as a post-modern science**

This story of my exploration of complexity as a post-modern science was written in 2010 and is presented as a piece of evidence, a real-life story on which I subsequently comment. I present it as it was written; otherwise I run the risk of tidying it up, making it less authentic and hence less of a test of the narrative method. Yet it is still, of course, not actual ‘raw data’; it was written retrospectively.<sup>94</sup> So it already has been sanitised, inadvertently tidied up just through the passage of time, even if I did not intend this.

Although I am presenting this story as an ‘exhibit’ in some sense – of how I theorise, of the efficacy of narrative to explore complex and contingent problems – I would like the reader to read this for content as well as process, as it contains some important arguments. I will draw attention to key aspects of the story as they strike me as I re-read it, through the use of text boxes.

### **Science as Narrative, Narrative as Science**

#### **Margaret and learning histories**

I begin this particular story with reading Margaret’s PhD thesis. Margaret was looking at the use of learning histories as a way to engage with creating change, sharing learning and

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<sup>93</sup> And develop in Chapter Two.

<sup>94</sup> Although some parts, for example the conference I describe in the middle section, were written very promptly, the day after the conference.

shifting attitudes towards the use of low carbon technology. A learning history is an account of what happened as particular people and organisations tried to introduce new technology and influence others; and it is an account told from many perspectives, through many eyes. It does not seek to find the dominant story but presents sometimes contradictory views, albeit framed and reflected on by the researcher and by others involved. So it presents a messy, complex, emerging story. Margaret wrote her PhD following the same form; did not try to close down the sometimes conflicting strands, left open what was open, told what happened and showed, sometimes, how her own thinking evolved through the process. What was the point of this? The point was that it allows the reader to join in the learning and meaning-making. Rather than be told what to conclude and learn by the writer, the reader is invited to engage in the process and uncover her own thoughts or learnings and engage strongly with certain parts of the story as she sees fit. That may create new insights or connections for the reader in her world in a way that is not directed or limited by the writer.

As I grappled with the reading of Margaret's PhD, I found that I 'got' the point of the narrative, learning history approach more deeply than I had before – and I felt it was because the form of the writing as a learning history itself allowed me to find my own way to relate to the ideas it embodied. It touched me emotionally as well as cognitively and this felt important and exciting. I seemed to have internalised a new understanding. I experienced the medium as the message; the narrative approach changed me as I engaged with it.

## Reading Toulmin

With these ideas of narrative and learning histories in my mind, I happened to be reading Toulmin's (2001) 'Return to Reason', sitting on a train. Toulmin's book explores the limitations to science, to Newton's science and explores our fascination with reason. When I got home I wrote:

'This perfect, logical, unemotional, universal, abstract, certain science describing the perfect, unchanging, stable world has more to do with religion than with facts'. I went on to write:

'What we need is a new science story, a post-modern science, a new definition of what science is all about. That will help us counter the tradition Newton unwittingly started. And that is what interests me.'

So the idea of linking post-modernism to science came into my head at that time.

This is an example of a coming together of influences. This is the sort of synergistic process that it would be easy, in a more traditional discussion about science, to ignore.

This statement about a post-modern science was a really important leap for me and started the inquiry into the nature of science which forms the basis of this chapter

## Darwin and a visit to a friend

The next part of this story centres on a visit to a social-scientist friend<sup>95</sup>. I was in the throes of editing a journal on Darwin and evolution and she produced a book from her shelves by Gillian Beer (1983), 'Darwin's Plots'. Professor Beer is a literary scholar at Cambridge and her interest was in how Darwin's 'Origin of Species' influenced late nineteenth-century authors such as George Eliot and Thomas Hardy. What interested *me* though, and leapt off the page, was her descriptions of the way he *wrote* the Origin. I copied down some of Beer's thoughts into my notebook.<sup>96</sup>

(1983:49) Darwin's language does not close itself off authoritatively nor describe its own circumference...He sought to move out beyond the false security of authority or even of the assumption that full knowledge may be reached. The nature of the argument led into expansion, transformation and redundancy of information. The Darwinian world is always capable of further description and such description generates fresh narrative and fresh metaphors which may supplant the initiating account....

(1983:6) Evolutionary theory is first a form of imaginative history. It cannot be experimentally demonstrated sufficiently in any present moment. So it is closer to narrative than to drama...

(1983:6) Evolutionary ideas shifted in very diverse ways the patterns through which we apprehend experience and hence the patterns through which we condense experience in the telling of it...

(1983:65) Darwin's work...is the description of a process of becoming and such a process does not move constantly in one direction.

I felt very excited. So Gillian Beer is saying that Darwin wrote the Origin as a narrative rather than as a scientific treatise of certainty and clarity; he included his uncertainty, he told the story of his experiments and reflections which triggered further experiments and reflections. AND the way he wrote the Origin reflects his theory of evolution – that messiness and variation sometimes trigger new patterns in the local ecology and

sometimes these new patterns may be better adapted than old patterns or other competing patterns and so sustain; other times they will be less well adapted and fade away. The process of evolution is thus understood as *essentially* local and messy and quirky and uncertain. Harré in 'The Philosophies of Science' points out (1972:176) that Darwin focuses on '*minute differences*', not a usual thing to do for scientists, who tend to look for what is common and repeatable.

I am interested that Harré focused on this issue of minute differences, contingency. It shows his quest for the nature of science and his questioning of the mainstream.

<sup>95</sup> Jean Hardy, already mentioned in Chapter Three.

<sup>96</sup> This is already reproduced in Chapter Two but I repeat it here as I wanted to keep the integrity of this story.

‘Indeed’, I thought, ‘evolutionary theory itself is post-modern in the sense that it shows that every situation is different, suggests outcomes are path-dependent, historically and contextually specific, and synergistic’.

So this book brought together for me the threads of my developing questions about science, my exploration of complexity theory and my recently-awoken interest in narrative. I returned home with science, narrative, evolution and post-modernism all connecting in my head.

## Lyotard and post-modern science

I wondered where to go next with this. I was not entirely clear what I meant by the phrase post-modern science. I remembered I had a copy of the classic book on post-modernism by Lyotard (1979) ‘The Postmodern Condition’. As I flicked through it I was somehow surprised to find a whole section on post-modern science. And I thought I had invented the phrase! Lyotard discusses the certainty which we accord to science and mathematics; he discusses the way that science is based on axioms that sit outside the theory and are often questioned by later science. He mentions Gödel’s theory of incompleteness: that no science or mathematics can be complete; that there will always be things that are ‘true’ that cannot be proven from within the system of thought or of mathematics. So he brings into question the notion of absolute truth or the possibility of a universal theory of everything and emphasises the need for a plurality of perspectives. He argues that perfect knowledge and hence certainty are not achievable – in part because the effort required to know the initial conditions exactly requires an impossible amount of work and energy and secondly, as quantum physics suggests, because total knowledge does not exist. He says (1979:60):

‘The conclusion we can draw... is that the continuous differentiable function [ie as exemplified by equations in calculus] is losing its pre-eminence as a paradigm of knowledge and prediction. Post-modern science – by concerning itself with such things as undecidables, the limits of precise control, conflicts characterised by incomplete information... – is theorising its own evolution as discontinuous, catastrophic... It is changing the meaning of the word knowledge while expressing how such a change can take place. It is producing not the known but the unknown.’


This is an extremely important quote, defining post-modern science and implying that to assume certainty and completeness when there is none cannot be deemed scientific.

Lyotard (1979:60) goes on to quote Medawar, (a Brazilian anatomist who considered the nature of science and wrote, amongst other things, ‘Advice to a Young Scientist’) as saying that, ‘having ideas is the scientist’s highest accomplishment.... a scientist is before anything else a person who ‘tells stories’. The only difference is that he is duty bound to [try to] verify them.’


## Particularity

Lyotard's focus is to question the universality of any scientific theory and emphasise the need both for pluralism and for questioning and bringing to light the axioms, the pre-suppositions on which any theory is built. So he warns us not to reify science, to recognise its limitations and not try to adopt any particular scientific theory or method as a theory of everything, as meta-narrative.

Taking this a step further; we can look at evolution and complexity theory as a new *sort* of science, where every situation is different and where it is the particular detail of choices and chances *in combination with* pre-existing relationships and laws and circumstances, which creates the next step. Where, if we generalise or average or smooth what is there or assume that the most likely path will be followed, we may throw out the very detail that is crucial to an understanding of what emerges. So, by ignoring the particularity of a situation, we run the risk not just of creating quantitative errors, but *qualitative* errors – i.e. we may miss the very moments and combinations of factors that are central to what actually is happening, is central to the future that is emerging. So I am suggesting that complexity science *is* post-modern science, and *is* narrative.



This is a central point to my argument made here – that if we ignore contingency and particularity our understanding can be qualitatively incorrect. It is arguing that, for complex problems, it would be unscientific to adopt traditional scientific methods



What do I mean when I say this? I mean that you have to follow each step in order to try to know what happens. Evolution is like journaling. After the event, we often create a story of what happened to us and what caused what. But when I go back to my diaries, I find that I have left out quite key events or feelings, that the events and outcomes were much more multi-faceted than I remember. And if I read *your* journal covering the same events I'd find there were even more factors contributing to the outcomes than I wrote at the time.

## A recent conference on narrative and what happened there

When I talked about all this – the idea of science as narrative – at a recent gathering of 'narrative' people, I felt I had gone to the opposite extreme from your average scientist and brought into question the validity of science at all. Margaret asked a good question about mathematics; was I throwing that out too? I felt depressed. Am I trying to tell a tidied-up, coherent story about all of this; am I being too definite that to see science as narrative is all that we need? Am I indeed running the risk of telling as *definite* a story as the science story I am bringing into question?

The next step in the process came by accident. I picked a book off the shelf in the library at the place where we were meeting. A rather odd book called 'The Orphic Voice' by Elizabeth Sewall (1960). Much to my astonishment, I found the title to a sub-section, 'Poetry agrees with science and not with logic', and read:

‘in science the friction occurs along the boundary where the exact sciences border up those which are not ‘exact’... if you cannot think in mathematics you have to think in words... this is partly because time and change are of the essence of living organisms whereas mathematics is essentially a timeless discipline.’

So this abstruse passage speaks to the fact that mathematics cannot cope with the messy evolutionary process of living things. It speaks to the question Margaret had just posed about mathematics. No I am not throwing out mathematics but I am recognising it is not good for everything. As Lyotard (1983:60) said ‘the continuous differentiable function is losing its pre-eminence as a paradigm of knowledge and prediction’.

This is an important paragraph. It is a good explanation of the limitations of mathematics, no matter how complex is the mathematics, to capture the necessary information.

The maths used by complexity theorists is more complex than simple differential equations; use of the so-called Master Equation<sup>97</sup>, for example, seeks to work with ensembles of possible pathways, not just the most likely path the system could take. But even these approaches, or approaches which allow for even more variation, still pin us to a degree of certainty in defining relationships and deciding what to include and what to ignore. As Lyotard (1979) also said, if we were to work with all the variation in say the behaviour of a city, it would take all the people in the city all their time to try and model it. Mathematics inevitably leaves out some detail and we cannot predict in advance what of the messy variation and detail will prove in hindsight to have been of critical importance.

## The car journey home – and Margaret again

The next step on which I focus in this story took place in driving back from the meeting. Margaret and I were musing on the complexity of it all, of this idea of science as narrative. We discussed that I had down-played, in my talk, the fact that some science stories are pretty ‘true’ in their context and **do** describe some universally-held laws such as electro-magnetism or gravity – which might be approximations in the full scheme of things, but provide enough certainty to design and run complex electricity systems and build aircraft and so on.

On the narrative side of the picture, Margaret raised the shadow of narrative approaches: the dangers of ‘merely’ presenting learning histories to people rather than drawing conclusions for the reader, presenting stories as examples to elucidate certain points. What she was saying was that readers may take out of learning histories something that was not really there, something that was not intended. Indeed she reminded me that so-called social Darwinism and eugenics, adopted by the Nazis, used Darwin’s work to justify social engineering and

This is an example of where a narrative approach captures something important that it would be easy to omit; Margaret has many times raised counter-arguments, ambiguity, conflicts. It limits the tidying up and concretising of any conclusions.

<sup>97</sup> Used by Prigogine and Allen and others (see Allen and Boulton 2011).



genocide. So, giving people the opportunity to engage with messy and pluralist stories *does* allow the possibility that the stories can be used manipulatively and ruthlessly. She also pointed out that those who want to influence can always find and promote stories that support what they want to happen or how they want people to feel about it. So there are issues of power and subjectivity in all this, as well as anything to do with truth.

It was good to reflect on the other side of the coin, not to get too fixed about seeing narrative and evolutionary and complexity approaches to science as being ‘the solution’. It is good to remember that every theory, by necessarily making simplifications and abstractions, is still not the same as practice.

### **5.4.3 What have I learnt from this narrative on science as narrative?**

This narrative account of my exploration of the congruence between narrative and science was very significant to me, really catalysed and exemplified a change in perspective that I made. In this section, I want to return to the questions I posed in section 5.4.1.

#### ***Do I think this narrative approach is an appropriate methodology for investigating complex problems?***

On the one hand, I think this approach gets fairly close to capturing what happened, potentially captures the turning points, shows areas of ambiguity, allows for the place of chance, recognises the illogical as well as the logical, shows how differing influences and events can synergistically affect what happens next. And, as I discuss in the next session, I think it allows some learning about how I theorise, or at least how I developed a theory in this instance.

On the other hand, it is still a retrospective, tidied-up account. It is selective; it is based on my memory of what seemed important, even though much of it was written the same weekend as the conference it describes. So it is still an account filtered through my own perspective as to what is important, what led to what. Perhaps I thought of the idea of a post-modern science because I had read Lyotard earlier and just forgotten I had read it (and it did not just ‘come to me’ as I describe in the narrative)? Perhaps, in truth, someone said something about post-modernism and that was the critical factor which I just don’t remember? The point is that I cannot be sure that what I have written in this narrative properly captures what actually happened.

Having made these comments, I do feel that a narrative approach such as this description of my own journey with narrative as science **is** indeed an appropriate methodology for investigating complex problems. It does capture much of the nuance of what happened, shows at least some of the influences on my thinking. It would be interesting to ask Margaret, for example, if she had anything to add; or to ask others if the journey reminded them of similar journeys they had taken when they developed their ideas. Had I just written this account in dry scientific language, it would have been easy to prejudice the logical over the emotional or over the chance events, such as finding a book on a shelf.

#### ***What have I learnt about my personal approach to theorising?***

First, I am struck again<sup>98</sup> by the extent to which my own theorising starts from an emotional reaction, an irritation that often results in questions I carry around for some time and which shape what I notice and how I respond to influences and inputs. I felt moved by Margaret’s learning history – in fact (to

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<sup>98</sup> As I was in Chapter Three.

tell more of the story)<sup>99</sup> I was moved by a little detail of how an important meeting of two people which was central to the success of the change process she was describing happened by accident in the vet's. And I felt moved by Toulmin's (2001) writing when I read it on the train, as I described.

I note the excitement when I felt I had invented the idea of some forms of science being post-modern. This was an 'aha' moment and I still remember how exciting it was. There was a sense in which the idea just emerged, was not consciously or logically developed. I was both pleased and disappointed later to find that others, Lyotard included, had reached this same conclusion.

I note the importance of dialogue – of being challenged by Margaret to think *around* my ideas, to see their flip side, to take a contrary position. I do not use this dialogic approach as much as Margaret does. It reminds me not to work too much on my own, to test ideas with others as well as dialogue with them myself.

I recognise my tendency to explore ideas through finding books; that I take questions to books and in some sense have a dialogue with the book about the question.

These aspects of my approach to theorising are congruent with those discussed in Chapter Three and do seem authentic to me; that is, they do ring true, feel representative of what I do.

But by reading this account I notice things about my process (for example, the way my emotions are engaged, and my tendency not to use a dialogic approach to theory-testing) that I am not sure I would have reported on had I been asked, in a straightforward manner, how I go about developing theories.

### ***What do I now think about the idea of post-modern science?***

I feel Darwin made a great leap forwards in getting us to see that, at least in biological and human systems, the context and particularity of events cannot be ignored if we are to understand what happens. It tells us that knowledge has limits, that generalising is dangerous and can lead us to throw out the very information that is vital to understand what is happening. Viewing complexity and evolutionary science as post-modern is a part of the legitimating of narrative as a way of exploring. It is a way of holding pluralism (in that narrative does not need only one discourse or perspective)<sup>100</sup>. And it reminds us that science itself is only a story, albeit a very useful and appropriate one in some contexts – but not when we elevate it to a meta-narrative, a worldview, as did the French Enlightenment to Newton's mechanical laws. I am reminded that all this matters, because how we choose to make sense of the world, how we reside in a meta-narrative of which we may only be partly aware, is a political act with profound consequences.

So I am excited by this idea of post-modern science. I have gained confidence in this position. Science is not science if it is not appropriate to the problem; and if contingent, particular, path-dependent events are fundamental to what emerges, we cannot explore such situations in average, generalised ways. So for those situations, giving detailed accounts, telling detailed stories, investigating particular situations in great detail rather than reviewing many situations statistically, is the appropriate scientific method. I would argue that taking a narrative approach can be viewed as a scientific method, if we define a method as scientific if it allows us to explore and engage appropriately with the important features of a problem that lead to understanding.

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<sup>99</sup> As discussed in Chapter Two.

<sup>100</sup> I return to a discussion of pluralism in the next chapter.



And to say some science is post-modern from an ontological perspective also reminds us, as Lyotard (1979) says, that some things in the world are ‘un-decidable’ and ‘conflicting’; that information is always incomplete, and also that some things are both unknown and unknowable. So a post-modern approach to science can reflect this complex nature of the world and not try to pretend it is otherwise in the name of science.

## **5.5 Conclusion**

The work in this chapter has shown that science is not as scientific as is commonly thought! What is science and what is not is to some extent a matter of convention – and that most scientific of sciences, Newtonian science, on which the scientific method is based, is in fact based on questionable axioms that are not often exposed or discussed.

I point out that, to use a strictly-scientific method to look at problems for which it was not intended does not make the exploration scientific; and to use pluralist and subjective approaches to explore complex social contingent situations may *indeed* be scientific if the method mirrors the nature of the dynamics and qualities of the issue.

I develop, through a personal learning history, a personal inquiry, the idea of complexity as a form of post-modern science. I build on this in the next chapter, in section 6.5.

## Chapter 6 What is complexity?

### 6.1 Introduction

I came to the work for this MPhil with more than ten years' experience of working with complexity theory. So, to a large degree, I had become clear in my own mind as to what it is, what approach made sense to me. And yet the work I describe in this thesis has caused me to reflect on this position at a deeper level and in a new way. In Chapter Three I asked why complexity theory appeals to me on a personal level. That exploration caused me to see that to explore what the world is and how the world changes calls on the *totality* of experience – including intuitions, dreams, the mystical, the unknown. So it caused me to broaden my definition of complexity to include the subjective and even the unknowable.

The exploration of science as narrative detailed in Chapter Five, equally, moved forwards my inquiry as to what *is* complexity science. I started to see the link with narrative, started to consider what it means to consider complexity as a post-modern science, capturing the tension between universality and contingency, between realism and relativism.

In this chapter, I start with classifications of different approaches to complexity as given by Byrne (2011) and by Richardson and Cilliers (2001). I build on these to suggest a framing that makes sense to me: complexity as realism, complexity as metaphor and complexity as postmodernism. I am looking at these themes as research paradigms. A research paradigm is defined by Blaikie (2007:3), as 'a broad philosophical and theoretical tradition within which attempts to understand the social world are constructed'. So I am considering the (often- implicit) ontology of these paradigms together with the common ways of knowing and together with the consequent methodologies that are used. I have found this framing of these three paradigms very interesting and fruitful. It has helped me to clarify where I sit and how to frame where I sit in discussion with others. And this integrated way of addressing research paradigms – combining ontology, epistemology and methodology – is quite rare in the complexity literature.

### 6.2 Classifications of approaches to complexity

#### 6.2.1 Introduction

In Chapter One, in section 1.5, I outlined a definition of complexity theory, focusing on what it means as a worldview. In that section, I have followed the tradition of Prigogine in emphasising that it embraces and explains evolutionary theory and pays attention to the role of variation. There are, however, many approaches to complexity science, many of which contradict each other in ways that are not immediately obvious and are often not made explicit. It is exploring and critiquing these contradictions that form the subject of this section.

I will begin by describing the ways that Richardson and Cilliers (2001) and then Byrne (2011) classify approaches to complexity.

#### 6.2.2 Two classifications of complexity

Richardson and Cilliers (2001) describe three themes or 'communities of practice' as they call them: hard complexity, soft complexity and complexity thinking. They describe hard complexity as a search for a 'theory of everything', a search for certainty through modelling complex situations. These 'hard'

approaches are driven by a belief that even complicated situations can be understood if the mathematics is complex enough, and a belief that the future is predictable.

Richardson and Cilliers (2001) describe soft complexity as focusing on the metaphorical use of complexity terms – terms such as the edge of chaos, emergence, far from equilibrium. Their complaint is that the users are not always rigorous in exploring the validity of the use of such concepts; this would not necessarily be problematic, but some users call on the fact that the concepts come from science to legitimise their use. Phelan (2001), whom they quote, calls this ‘pseudo-science’.

Their third category is ‘complexity thinking’, which they say (2001:7) ‘focuses on the epistemological consequences of assuming the ubiquity of complexity’. They go on to say that this category is the least well represented in the literature as it requires (2001:8) ‘a shift in philosophical attitude’.

Richardson and Cilliers (2001) differentiate working with metaphor from ‘complexity thinking’ and they explore ‘complexity thinking’ as an epistemological issue, as an approach to *knowing about* a complex world. I interpret this as meaning that they see ‘complexity thinking’ as trying to know about the complex world through the method of thinking about it. I would argue that using metaphors is one way to do this thinking. So I am not sure their categories – of soft complexity (i.e. use of metaphor) and complexity thinking – are so distinct. And they seem not to pay attention to another sort of ‘complexity thinking’ which is more to do with ontology, with worldview. As this focus on ontology seems important to me, I am interested in this omission.

David Byrne (2011) also classifies approaches to complexity; his categories are ‘social physics’ (akin to Richardson and Cilliers’ hard complexity), post-modernism and complex realism. He argues that for some, complexity is just another form of social physics, amenable to modelling and simulation (2011:2) ‘which remains in important respects merely reductionist’. That is to say, this ‘hard’ complexity sees the world as more complicated than a simple Newtonian machine, but still suggests it can be understood clearly and the future can be predicted – if only we include enough non-linear terms and enough actors and agents.

For others, Byrne says, complexity is post-modernist (2011:2) ‘in terms which dismiss the possibility of systematic social inquiry that can in some way produce valid representations of the social and in particular inform any useful account of social causality’. So he is saying that, for some, complexity is just another way of describing a relativist view of the world. I return to this point in a later section to compare this view with a more (in my opinion) favourable view of how complexity can be viewed as post-modern, building on my discussion in the previous chapter, in section 5.4.

For yet others, including Byrne himself, complexity is ‘complex realism’ which he defines as (2001:2) ‘a position which remains within the modernist programme of progressive thought whilst at the same time rejecting the canons of reductionist positivism’. So he is saying the world, in the main, is ‘real’, but is not subject to being understood entirely in terms of unambiguous causal relationships as would be the case with a positivist framing.

Building on these categorisations, in the next sections, I am going to explore three distinct research paradigms for the complexity sciences: complexity as realism, complexity as metaphor, and complexity as postmodernism.

## 6.3 Complexity as realism

### 6.3.1 Realism versus positivism

Richardson and Cilliers (2001) and Byrne (2011) refer, in their classifications of complexity, to the 'hard' end of complexity - acting as if the social world can be treated as an objective, concrete problem, amenable to description through logical relationships and mathematical definition.

Richardson and Cilliers (2001) indeed seem to imply all modellers are positivists, acting as if the world can be understood in terms of deterministic mathematics. It is certainly the case that many complexity mathematical modellers are indeed positivist and do indeed act as if the world is reducible to mathematics, albeit non-linear complicated mathematics with many degrees of freedom. The ontological image lurking in the minds of such complexity scientists is of a world that is complicated but is in principle knowable and predictable. At complexity conferences populated primarily by physicists and biologists, the approach and discourse is dominated by the positivist language of deterministic mathematics.

But not all complexity mathematical modellers share this positivist ontology. Allen (1997) and Haken (1977) and Edmunds (2010), for example, include variation and uncertainty in their models. They believe that the world follows an evolutionary process, that the future is in principle unknowable, that each situation is different. These modellers are not positivists but realists. Or at least they are adopting a realist stance in their modelling (even if they know this is a simplification). They think – or at least they act – as if the world is real, even if that 'realness' is complex, hard to know and may evolve and change over time. They accept that the world may evolve in unpredictable ways – into some new realness. Realism (Blaikie, 2007:13) is defined as when 'both natural and social phenomena have an *existence independent* of the activities of the human observer'. So there is an inference, when such modellers model the social world, that even the social world can be modelled and understood objectively, even though the models may expose more than one possible future.

I would argue that many complexity modellers of social systems do not really hold such a strict realist ontology about the world; they do not really think the world is entirely objective, real, viewable in the same way by anyone and everyone. To the extent that they would articulate it, they would say that modelling gives useful information, that more subjective aspects of human life are hard to include, and that such 'real' models are a step forwards to gain some understanding of complex situations and point to possible futures and outcomes.

Also, I would say that modellers in general are quite aware that, by simplifying the real world into a model, there are consequences in this reduction of information. To quote Richardson and Cilliers (2001:12): 'Since the nonlinear nature of the interactions in complex systems renders them incompressible, we cannot have perfect descriptions of complex systems that are simpler than the systems themselves'. In other words, they know the map can never be the territory.

But, as I have said, whatever their actual ontological views, such modellers *do* adopt a realist *epistemology* in adopting mathematical models. They do work with simplified models which reduce the complexity of the model compared to the 'real' world. They view modelling as one way, an important way, to know something about the world. Most would accept that the outcomes of the models must be handled carefully, and treated as an experiment, a type of conversation, of question and answer. But, for complex problems they feel that some aspects of the problem can be explored that are not amenable merely to 'thinking about it' or even to experiment. And, clearly, even 'thinking

about it' in common language is a way of modelling the world that limits to what we pay attention and how we frame what we see. And every sort of research methodology necessarily closes off some information, boundaries the problem in some way, ignores some aspects of the situation. In some ways the difficulty arises with the recipients of such modelling, the policy-makers or the public, who expect models to give certainty.

### 6.3.2 Realist language

Complexity theory can very easily fall into realism, into the 'Modern Project', as some call it. Examples of this are how easy it is to ask questions such as 'how can we spot a tipping point?', 'how can we control a tipping point?' as I discuss in Chapter Seven.

This 'realist gaze' can be felt in the language we use. In a meeting I attended where we were discussing complexity theory, we talked about the difference between talking about something as systemic, and describing something as a system (complex or otherwise). 'Systemic' is emphasising the interconnectivity, reflexivity of 'things' and fits with the notion of a relational, participative, connected world. But what is it to assert that something, perhaps an organisation, **is** a complex system? One argument is to say that what this is meant to convey is that the elements of the system, let's say people, are connected by non-linear forces and that these forces can change and people can learn and the boundaries of the system can change and be permeable. So, in a sense, to say an organisation is a complex system is to say no more than everything is connected in a reflexive fashion. But, of course, the *form* and language of the statement, in the same way as describing the economy as a train (with which metaphor I introduced the topic of this thesis) create its own image and implied epistemology. So it suggests we can identify the 'elements' and what is in them; we can identify the forces; we can assume that an element-and-force model contains all the relevant information that is there, or that we need to understand the problem. Stacey (2001) is particularly impassioned about this realist language, expressed in his oft-quoted assertion that there is no such thing as a system. The word 'system' can only be a representation, a shorthand, for some aspects of what is there. How would such a description capture the effect of mirror neurons or the role of the collective unconscious or the 'memory' of the organisation or the impact of having a fly infestation or the result of the boiler constantly breaking down and making everyone miserable with cold?

So, realist language is pervasive within complexity circles and we can forget that such realism can leave out many aspects of the world that cannot easily be captured by such language.

As a further example, let us consider the culture in an organisation. The culture – which might be described by adjectives such as hierarchical or sociable or commercial or customer-focused – or indeed any combination of these and other such adjectives – can be seen as an example of patterning of behaviours and relationships. The culture is both shaped by behaviours – and indeed describes generally-found patterns in behaviours - and yet is normative, will shape behaviours as much as it will be shaped by them<sup>101</sup>.

Culture is measurable in the sense that people in the organisation or people who know the organisation well can be asked to describe it or vote for different words that describe it and this can be turned into statistical data. But is the notion of culture 'real'? Cultures can certainly be compared. Most people would think the culture of the army is more hierarchical than that of a farm run as a

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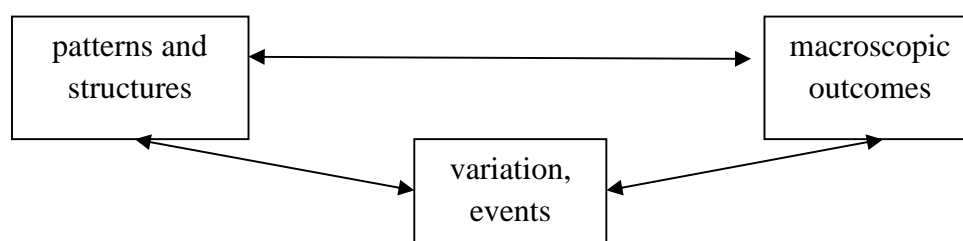
<sup>101</sup> So, for example, someone new to an organisation may behave in ways that do not fit the culture. They will feel the pressure to conform; at the same time their incongruent behaviour may shift the cultural norm.

cooperative. But there will always be a range of perspectives on this, depending on people's experience and on that with which they are making a comparison. Heron, Reason (Heron and Reason 1997) use the phrase 'critical subjectivity'<sup>102</sup> to express the need to work with several perspectives in trying to establish, for example, the nature of the culture of an organisation. Even this is problematic as whose perspectives are to be included, how is agreement to be reached. And indeed, in this example, there is still, for some, an assumption that culture *exists*. So it is important to reflect on the way that realist language can blind us to implicit assumptions about reality and solidity when in fact all we can be sure of is that, in an organisation, people interact in ways that are a combination of obvious and less-than-obvious.

### 6.3.3 Middle-ground realism and complexity

The subject of realism has a wide literature and realism has many colours and flavours and in this section I want to consider one theme within realism which is referred to, variously, as critical realism, emergent realism, complex realism, middle-ground realism and even 'bread and butter' realism (Pawson 2006:19).

Pawson defines realism (2006:18) as neither law-seeking nor concerned with documenting the unique but occupies a middle ground between these two positions.



These statements strike a chord with Prigogine and Allen's discussion of self-organisation, encapsulated in the diagram above<sup>103</sup>. Prigogine and Allen say that the outcome derives from the interplay of the detailed history of events with the patterns and structures that exist between the elements of the system; events and history can modify current patterns and structures. So, in times of stability the patterns and structures will predominantly determine outcomes, in times of instability critical events will predominantly determine outcomes and in general outcomes are a complex combination of the interplay between the two. As Prigogine (Prigogine, Allen et al 1977:39) says:

'Thus we find a natural expression of the idea that societies function as a machine – referring to the deterministic periods between instabilities, and society as being dominated by 'critical events' (e.g. 'great men') – which occur at the points of instability. Far from opposing 'chance' and 'necessity' we see that both aspects are essential in the description of non-linear systems far from equilibrium.'<sup>104</sup>

<sup>102</sup> Reason et al's method recognises the 'social construction' of culture. I return to social construction in section 6.5.

<sup>103</sup> This diagram is modified from Prigogine, Allen and Herman (1977:39).

<sup>104</sup> This excerpt could be misunderstood if taken out of context. They are not saying, 'the world is a machine and occasionally acted on by great men', they are showing why such myths arise as they have some validity in the

Pawson (2006:18) indeed raises the issue of open systems, to which Prigogine is referring and points out that, for open systems, 'when social science tries to focus on what seems a uniform pattern of behaviour it soon discovers that it is shaped by historical forces'. Pawson goes on to say that institutional forces and personal choices also play a significant part. So Pawson's description of middle-ground realism is very much in tune with complexity thinking.

Pawson asserts that it is important to develop and critique explanatory possibilities which make sense of data, even though it is inevitable that 'further explanatory possibilities remain untapped in the unrelentingly open systems in which we live'. So Pawson is developing the idea that in open systems there is often more than one possibility as to the patterns that might already have emerged and more than one possibility as to the patterns that might yet emerge. We may have a hypothesis about current patterns, but we cannot be certain which exists<sup>105</sup> and we can be even less certain about the future.

Bhaskar describes these 'explanatory possibilities' as generative structures which (Blaikie 2007:148) 'both enable and constrain events'. This focus on patterns of relationships is very in tune with complexity thinking.

Blaikie (2007:150) explains that there are two broad camps of thought, centred around the ideas of Bhaskar and of Harré. He clarifies that for Bhaskar, social structures are central and have a causal role to play; they exist independently of social actors and their activities<sup>106</sup>. For Harré, social structures are intimately related to social activities, and have no causal efficacy. Complexity thinking, and indeed Pawson, would very much sit with Harré, not Bhaskar, on this matter; social structures and patterns of relationships are not independent of social actors and their decisions; and whilst current patterns shape and influence actions<sup>107</sup>, they cannot be regarded as strictly causal. Our decisions and actions are a complex interplay of choice, albeit shaped by context (current patterns) and chance and history – but not causally determined by any single factor. Veblen, in 1898, used the term 'cumulative causation', to capture this essence.

Byrne (2011(a)) builds on these ideas and posits the notion of 'complex realism'. He summarises his position in an equation (2011(a):132)

$$\text{Mechanism \& Context} \Rightarrow \text{Outcome}$$

He elucidates this equation in saying 'generative mechanism *in interaction with* context generates directionality of outcome.' He goes on to say (Byrne 2011(a):133) that these outcomes are 'almost always contingent, complex and multiple'.

So the views of Pawson, Harré, Byrne and Prigogine do overlap to a great degree. Yet the realist stance still conveys a feeling that these generative mechanisms, these patternings, can be identified and defined and that they exist solidly, if temporarily. There is perhaps an issue of language and a subtly-conveyed sense that we can get to grips with what is happening. What is left out? The realist position conveys an image of people connected by forces. It loses the subtlety of man as a creature influenced by the subjective and qualitative, by the imagination, by moods. Clearly people are hard to

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extreme situations of very stable – when patterns do survive for some time, and extreme instability, where the particularity of events dominates outcomes.

<sup>105</sup> Unless we look but even then what patterns exist can be ambiguous, subject to interpretation.

<sup>106</sup> This statement resonates with my discussion in section 6.3.2 of how, for some, culture 'exists'.

<sup>107</sup> Both '*enable and constrain events*' as Bhaskar says.

model as they do not make decisions just based on logical analysis, but for a multiplicity of reasons. Economic models, which tend to assume the existence of rational economic man, are particularly compromised by this issue.

The realist position also struggles with notions of interfusion and interdependency<sup>108</sup>, and with field-theory ideas. Field theories emphasise that some qualities can best be thought of as dispersed, diffuse, not represented in the language of ‘things’ connected by forces.<sup>109</sup> I return to this theme in section 6.5.

## **6.4 Soft complexity: Metaphor and complexity thinking**

### **6.4.1 The use of complexity concepts as metaphor**

One development of the realist tradition is the use of complexity concepts as metaphor. The mathematical modellers have derived many terms to describe the kind of behaviours and effects that complex systems demonstrate. These include: fractals, edge of chaos, attractor basins, tipping points, self-organisation, the butterfly effect, sensitivity to initial conditions, power laws, emergence – amongst others. So the implicit ontology of the users of metaphor, is to assume the world is made up of complexity concepts; that the world *does* have tipping points, that organisations *are* fractal, that economies *are* subject to the butterfly effect. It is a sort of realist world filled with complexity artefacts.

This is problematic for a number of reasons. These terms do not all come from the same ontological assumptions and some of them are contradictory. For example, the deterministic equations of chaos theory show patterns in their solutions over time, one of these being seemingly chaotic behaviour. How this time sequence unfolds – i.e. whether or when there is chaotic behaviour – is set by the initial conditions. But does this happen in the social world? In general complex situations are *not* sensitive to initial conditions but reach similar outcomes wherever they start – an effect known as ‘equifinality’ (von Bertalanffy 1969). The technical way to understand this would be to say that the system develops and then becomes locked in to a particular attractor basin – and will reach that position if it begins in the vicinity of that basin<sup>110</sup>.

A particularly extreme example of stringing together complexity concepts in somewhat confusing – or even meaningless – fashion is given in the excerpt below. This is an excerpt of an informal paper I was asked to comment on, talking about how complexity thinking can help with finding ways to mobilise action to combat climate change. The author said:

It would work to establish a vectored field of emergent values and convergent objectives within which synergistic emergence of autopoiesis would be constrained.

It would catalyse the rapid viral spread of replicating multi-scalar cellular networks with maximum connectivity and optimum interactivity.

Such statements as these above seem unhelpful to me, to say the least. They suggest a sort of scientific magic; the reader may not understand what the writer means, but it suggests the writer has access to a new sort of scientific knowledge which could help to save the world. The reader (of this excerpt) is asked to take this on trust.

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<sup>108</sup> Discussed in section 4.3.3, Heron (1992:171).

<sup>109</sup> For example, Gestalt field theory, quantum field theory.

<sup>110</sup> I define the terms state-space and attractor basin in Annex 7.8.



However, this approach (although not in such extreme form) is used very extensively in management studies and management practice in particular.

Use of metaphor is of course a common practice. A metaphor is a figure of speech in which an implied comparison is made between two disparate things that actually may have something in common. Proctor and Larson (2005) define metaphor as a mapping between domains, a transfer of one domain to another to facilitate meaning. Hill and Levenhagen (1995:1057) suggest metaphors are 'a means for individuals...to create and share understanding. These mental models establish images, names and an understanding of how things fit together.' So metaphors can be useful, can help to convey and compare the ideas from one domain to another. For example, if I say the world works more like an organism than like a machine, the metaphors of 'organism' and 'machine' convey a great deal of information in a pithy and concise and precise way.

But can we introduce *anything* as metaphor? If that were acceptable, it would be possible to dodge the question as to whether a metaphor is appropriate or misleading. To give an example, a particular agent-based model developed in the 1980s by Chris Langton at the Santa Fe Institute (Waldrop 1992) showed a phase change in behaviour under certain conditions. This was nicknamed 'the edge of chaos'. This was taken up by management theorists (including Stacey (1991) at the time, who later became very opposed to such language) who suggested that the edge of chaos was a productive and creative place to be and organisations were to be encouraged to find this place. But **is** there an edge of chaos, generally, in complex situations? And if there is, should we be aiming to be there? And if we do indeed aim to place an organisation on the edge of chaos, how do we do it? So I (and many others in the literature) would argue that it is in effect misleading and even mendacious to introduce this metaphor – 'edge of chaos' – and assert it is a 'good thing' – particularly as its use is often accompanied with an implicit if not explicit overtone of 'it must be true because science says it is true'.

So a concern with Complexity Metaphorists (to coin a term) is with their implicit methodology – that is to say the complexity-metaphor users seem implicitly to assert that such metaphors apply to the social world and then their research methodology is to 'think about' what they mean in practice and then design organisation and personal change programmes in line with the results of their 'thinking'. Many seem implicitly to treat the complexity concepts as if they were real objects. They then imagine the consequences of the existence – of, say, the butterfly effect or attractor basins – and plan actions and design interventions to accord with the consequences they have imagined. And they validate their approach by saying that this is complexity theory in action. This is obviously lacking in rigour; useful as a thinking process but potentially dangerous if taken too literally into an analysis of a situation and a planning of consequent actions.

Here are some more examples.

Darwin's evolutionary theory was summed up in the phrase 'survival of the fittest'. This 'metaphor' was used to justify eugenics, and indeed the implied effectiveness of competition underpins and justifies beliefs in the rightness of 'leaving things to the market', the current prevailing neo-liberal approach to economic policy. In fact, as Mary Midgley (2011) pointed out in a recent New Scientist article, Darwin equally emphasised cooperation. So the choice of metaphor, particularly if it is supposedly situated in scientific justification, is very powerful, can be misleading, but, because it is a metaphor, is not subject to the sort of rigorous scrutiny that would come out of research-based conclusions.

Yet another example of the dangers of metaphor: a colleague told me of an organisation consultant lecturing at a meeting of systems thinkers. He, the consultant, apparently stated that organisations, being complex systems, are fractal. That is to say that the characteristics at different levels in the organisation are self-similar, have identical characteristics. To state this means that individuals, teams, divisions and global organisations all work in identical ways. This seems like a grand claim. Global organisations deal with the global economy, are affected by climate change, by wars and new technologies. The dynamics of a team in the finance department can be understood more prosaically in terms of the task, the personalities of the individuals in the team, the culture of the organisation. In general, the dimensions of the problem are different at different levels. Fractal behaviour is an artefact of chaos equations, which tend to have very few degrees of freedom and are not good representations of the very complex, changing, open relationships within organisations. But this consultant – and many others (for example (Jackson 2003)) assert that organisations can be thought of as fractal; if organisations were fractal then behaviour at every level would be self-similar. This implies that the understanding we have of one level in an organisation is applicable to every level, that leadership qualities are the same at every level and so on. This would be hard with which to agree – and certainly hard to prove.

#### **6.4.2 Differences in the assumptions within mathematical models leads to differing meanings for complexity metaphors**

One of the issues for those trying to engage with complexity theory at a metaphorical level is that complexity metaphors are in the main derived from mathematical models and there are a number of types of mathematical models. The classes of models are sometimes contradictory and lead to differing implications for action. They are often based on differing assumptions and what these assumptions are is not always made explicit. This may not on the surface seem important, but the models lead to differing understandings of the meaning of terms such as ‘tipping point’ or ‘self-regulation’. And different meanings suggest different strategies for action.

##### **Self-regulation**

To give one example, a recent television programme was reviewing the early history of ecology and said that the early models suggested the ecology operated like a machine. In one sense this is true. Models such as Daisyworld developed by James Lovelock (Watson and Lovelock 1983) are indeed very simple machine-like models. Daisyworld uses the maths of coupled oscillators and shows a straightforward sort of self-regulation based on feedback loops. This was a great step forwards in demonstrating how interconnections between an ecology and the sun can self-regulate the temperature of the planet and it has been very powerful. But I am sure James Lovelock never meant to suggest this worked just like a machine.

In practice, apart from the fact, of course, that there are many species on the planet and many types of interactions that affect climate, there is also variation (differences within a species) and diversity (lots of species). Some small change can, in certain circumstances, ‘invade’ existing patterns and structures and cause a new quality or factor to emerge, one that was scarcely noticed before. An example would be the escape of a ferret from a zoo or the introduction of rabbits to Australia. In no time at all, if conditions are right, these ferrets or rabbits start to modify existing balances in ecologies and a new ecology emerges. Such self-organising processes are not easily understandable in classical mathematical models like Lovelock’s, as it is difficult to know which, of the myriad possibilities which at the beginning are insignificant, may grow to become significant. And such new invasions

may corrupt existing self-regulating patterns or they may not. If we took literally that Daisyworld is a good representation of how the world is, it would be easy to suggest that self-regulation will always work – in other words, that the natural balancing act of nature will always return it to balance. But one can show that the role of variation and of diversity in self-regulation suggests that this may not be the case – and of course experience also tells us that not all ecologies survive; there are dead zones in the ocean, barren areas of waste, ecologies that have gone past the point of no return.

## **Tipping points**

I include, in Annex 6.1, a critique, based on Scheffer's (2009) book 'Critical Transitions in Nature and Society', of different sorts of models which purport to describe tipping points and I discuss how each presents us with distinct and differing views as to what a tipping point is, and suggest differing implications as to how to react to them. My concern is that, first, Scheffer, like many authors, does not explain the assumptions behind the models he quotes. The work tends to suggest tipping points are clear unambiguous things, triggered by either initial conditions, or 'last straws' or external shocks. I explore tipping points in much more detail in the next chapter, but I wanted to include, here, an example of the problems of metaphorical use of such terms when our understanding of such phenomena is based on mathematical models which may or may not bear any relationship with the social world.

So there are many models and ways to understand tipping, and these give very different feels for what causes tipping. But does all this matter? On the one hand, one can argue that the important thing is that people believe that change can sometimes be fast, irreversible, radical; runaway climate change is not only possible but likely; economies may shift into new regimes however we try to control them. One can argue that giving up on the belief that the future is predictable, controllable and indeed reversible is *the* important issue. And that the detail of the possible forms of this shift is less important. And in the main I accord with this position.

But, on the other hand, if we *do* give power to metaphors based on models and base our actions on what we think the metaphors mean, then we, and authors, have a responsibility to understand what assumptions are implicit in the models, how relevant those assumptions are to the problem in question, and what they imply. This is particularly important because it is often the case that these mathematical and scientific methods are given weight because they are mathematical and scientific.

## **6.4.3 Conclusion**

Clearly I am exercised and concerned by an ill-considered use of complexity metaphor. Metaphor can clearly be a useful way to explore ideas, to capture the essence of learning in one domain and try it out in another. But if, when transferring metaphors from science into the social sciences, there is an implied assertion that 'it must be true because it is science', if we take the metaphor too far without ensuring there is evidence it really fits the context, then 'complexity thinking' runs the risk of being more of a hindrance than a help.

## **6.5 Complexity as post-modernism**

### **6.5.1 What is post-modernism?**

The final category described in these classifications of complexity is post-modernism and I want to explore post-modernism as a research paradigm. Post-modernism is a broad term, which, as Byrne

(2011) suggests, has a range of meanings. It embraces within its spectrum a range of ontological and epistemological statements about the world; for some it suggests relativism, that everything is a matter of opinion. For others the focus is on contingency, that the world is different every time in every situation. There is also an emphasis on pluralist ways of knowing. Taken to extreme it can suggest that everything is relative, that it is impossible to know or learn or generalise about anything. As Blaikie (2007:50) says, of post-modernism, in extremis 'all social constructions are considered to be valid, and none is privileged over any other.'

So this is a broad church and, as I started to develop in section 5.4.2, I think that complexity theory can sit within this church as a post-modern science. I call it a science because it posits universal characteristics about the nature of the complex world – characteristics such as path-dependency, unpredictable emergence of new features, a tendency towards synergistic and reflexive relationships between factors. So (paradoxically), one can argue that it is universally the case that social and natural systems can only reliably be understood in terms of the history and context and detail of each situation. Any situation in the social or natural world that can be understood more simply, statistically, in terms of relationships between macroscopic characteristics, is, complexity theory would emphasise, temporary. Furthermore current patterns of relationships will not in general allow predictions as to how the situation might change and in to what. In generalising, we may lose sight of some vital aspects of the process, which means our understanding and learning is compromised and we may reach erroneous conclusions.

This point – about the dangers of working statistically – was brought alive for me through discussing some work undertaken in the 1980s by Peter Allen (1988). He was at the time looking at predator-prey models. These models, at their simplest, seek to explore the balance that might occur between two species – foxes, say, and rabbits. Foxes eat rabbits and the only other variables are that both species can give birth and die. If you solve this problem probabilistically, assuming that foxes and rabbits breed and die at average rates, you can find a single solution which gives the balance between the species. The rabbits breed just fast enough not to be wiped out by the foxes and you can calculate the ratio of rabbits to foxes. But, of course, in a particular field at a particular time, breeding will not be average. If rabbits breed rather slowly, or the foxes breed rather fast, then the foxes may wipe the rabbits out and then die themselves.

This simple piece of modelling demonstrates a very important point. That working statistically, with averages and ignoring variation can give you an answer that is qualitatively wrong – not a little bit wrong, but entirely wrong. In some fields initially populated by rabbits and foxes, the balance point, the result, would be no animals at all; only in some fields would a balance be found. This is just one example of how the use of models reduces the complexity of the situation of interest; and how understanding the implications of adopting such simplifying processes is of real importance.

### **6.5.2 Relativism?**

Relativism is in general regarded as part of a post-modern stance and hence it is an important issue to discuss.

From an ontological viewpoint, many social situations are relative. Many social situations cannot be understood objectively with any certainty and depend on your point of view. Are people happy? What are the primary communication channels in this organisation? How do decisions get made? These are all questions to which many people, looking at the same situations, would have differing views.

However, one can argue that some aspects of the human world are more objective, less subject to opinion. For example, we can measure the distribution of housing in a city and measure the demographics of that city. We can measure who buys what, how wealthy people are. We can track migration patterns. We can even, reasonably, investigate man's impact on the climate. So, many complexity theorists would argue that, whilst the world is not entirely objective, using realist methodologies will at least allow the investigation of certain complex problems with more rigour than if we just 'think about them'.

Brian Goodwin is very interesting on this point. He said, in an interview, (Brockman 1997):

'Objectivity is something that comes out of consensus between subjects who have agreed methods of practising science. If there is no consensus in science there is not agreement and hence no 'truth'.

'Scientists virtually all agree that there's a real world that's being investigated by science. But science itself, and the tools of science, are social constructs. The knowledge you get from science is real knowledge about the real world. .. So there's this strong element of social construction in science, but I am not a relativist.'

Goodwin is saying, it would seem, that whilst the world may be real, we can never really know that real world absolutely and we must not forget that science and its tools are themselves socially constructed.

Reason (1998(a):429) has commented about the implications of a relativist ontology. He says that the relativist position is when 'what we take for reality is nothing more than a construction of the human mind... reality is a human creation embedded in language.'

Reason is not arguing for a relativist position. He goes on to say that we are alienated from our experience 'if all we can do is circle around various forms of relativist construction'. He expresses the view that (1998:46) (1998:46): 'Mind and the given cosmos are engaged in a co-creative dance, so that what emerges as reality is the fruit of an interaction of the given cosmos and the way the mind engages with it.... Reality is subjective-objective, always called into being and shaped by the participation of the knower in what is known.' This quote contains a number of ideas. In part Reason is saying that knowing is real to the knower even if it is different from what another knower might experience. So my reality depends on me, how I interact with 'out there'; your reality will be different. But he is saying more than this, starting to address the idea of non-duality which I will return to in the next section.

Paul Cilliers (1998:xiii), in his book 'Complexity and Postmodernism' also considers the issue of relativism. He says:

'Instead of trying to analyse complex phenomena in terms of single or essential principles, [postmodern] approaches acknowledge it is not possible to tell a single or exclusive story about something that is really complex. The acknowledgment of complexity, however, certainly does *not* lead to the conclusion that anything goes.'

Cilliers is expressing in this quote the need for pluralism and differentiating pluralism from relativism: from 'anything goes'.

I am showing in these paragraphs that discussions about realism and relativism are themselves complex and paradoxical. There is a continuum between ‘absolutely real’ and ‘entirely a matter of opinion’ which Allen and Goodwin and Reason and Cilliers are all exploring. And there is a distinction between, on the one hand, the ontology, the nature of the world which may be ‘fairly real’<sup>111</sup> – and on the other, how we can find out about that world, with the latter being to a large extent socially constructed. I am touching on a very wide debate and literature here and I am aware this commentary is only starting to explore a very complex set of issues.

My focus in considering complexity as post-modern, however, is to embrace the issue of contingency and the need for a pluralist epistemology. I, too, am not arguing for a relativist position, not suggesting that the relativist aspect of post-modernism is centrally incorporated in the idea of complexity as a post-modern science.

### **6.5.3 Subjective, intuitive and unknowable**

As well as a discussion on relativism, there is a related question to ponder, however, with regard to seeing complexity as a post-modern science and this is whether complexity theory embraces the unknowable, the intuitive, the unconscious. Post-modernism does, within its broad remit, embrace the numinous.<sup>112</sup> I have argued in Chapter Three (section 3.5.6) that there is no reason to ignore the subjective and non-rational in complexity theory; it is there in the world as part of the complexity of the world. And I have argued in Chapter Five (section 5.3) that there is no reason explicitly to exclude the subjective from science in general.

But few complexity theorists deal with this. An exception to this is Brian Goodwin (2005), as discussed in section 5.3 and Ilya Prigogine himself also thought in this way. In 1981, Prigogine wrote (Prigogine 1996:42) ‘Scientific knowledge, drawn from the dreams of inspired – that is supernatural – revelation, can be seen today as at once the ‘poetic echo’ of nature and a natural process within nature: an open process of production and invention in an open, productive and inventive world.’

Simpson (2010) too is keen to find ways to embrace and find ways to acknowledge and speak about the unknowable aspects of the world and their relevance to understanding social systems. I was really struck by his exploration of this. How can you research the unresearchable? How can you even acknowledge the need to research the unknowable in academic circles? This seems to me a really important line of inquiry.

### **6.5.4 Complexity, a post-modern science**

So I am arguing that there is value in defining this third research paradigm – ‘complexity as post-modern science’ - as distinct from ‘complexity as realism’ and ‘complexity as metaphor’.

This statement, ‘complexity is a post-modern science’, is intended to represent the notion of contingency, the implications of emergence and the need for pluralist ways of knowing. But, as Cilliers and Byrne have argued, it is possible to embrace these factors in a form of realism; we do not need to call on post-modernism to include these aspects. But what the post-modern framing embraces

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<sup>111</sup> But may also include ‘non-real’, unknowable, numinous aspects, as I go on to explore. The use of the term ‘fairly real’ is also meant to convey that there are many and various shades of realism (shallow, cautious, subtle) described, for example, by Blaikie (2007:14).

<sup>112</sup> Rudolph Otto (1958), who coined the concept of ‘the numinous’, was influenced by Kant’s philosophy that ‘time as well as space is subjective, not a thing, but a form of sense.’

*in addition* and exclusively is the inclusion of qualities, the unknowable, the numinous. And, as I discussed at the end of section 6.3, it also allows for the inclusion of dispersed and interpenetrating characteristics, ideas of non-duality in Buddhist philosophy.

Furthermore, to call complexity post-modern<sup>113</sup> is also to give modelling as a part of knowing much less prominence and to bring to the fore the need for pluralism. Even the generative patterns that realists refer to are not entirely real and depend on one's perspective<sup>114</sup>.

And to emphasise that complexity is a post-modern *science* is also to bring focus on the narrow definitions of the way science is traditionally considered, as discussed in Chapter Five.

And, to be clear, this is not to embrace the loose relativism that some post-modernism embraces.

So it is here, with complexity as a post-modern science, where I sit. And, reading Prigogine's (1996) later work, I imagine he would sit here too. This is not to deny the role of modelling in exploring complex problems as I have already discussed. But it is to emphasise the need for a focus on other ways of knowing about a complex world, for example narrative methods, as Byrne himself emphasises (2011), and to allow the unknowable, numinous qualities to be there too.

## 6.6 Conclusions

In this chapter, I define three groupings of complexity theories – complexity as realism, complexity as metaphor and complexity as post-modern science. Are these differing complexity theories useful? I would say that realist approaches, often based on mathematical modelling, are useful if we understand their limitations. Climate change modelling, for example, is indeed useful providing we keep in mind that the outcomes are provisional, are only as good as the assumptions they include and the data on which they are based. But we would not understand very much about the dynamics of climate change without modelling.

Equally, using complexity concepts as metaphor can be very useful providing we do not take the concepts too literally, or harden them into definite statements about the nature of the world. But they do give a language to open up fresh considerations and discourse. They make us think, act as a shorthand, allow for the idea that there are other ways of looking at things than a traditional focus on planning, measurement and control. 'We are nearing a tipping point in climate change' may be too rigid, too certain, but it is a better discourse than talking about it as if it were a slow incremental change, easily reversed.

But, my primary and heart-felt conclusion is that considering complexity as a form of post-modernism, as a post-modern science, is the most useful aspect of complexity thinking. It emphasises the contingent quality of complexity; it emphasises the need for pluralist ways of knowing; it allows for the unknowable, the emergent and uncertain future. It indeed emphasises the limitations of traditional definitions of science. And it embraces the inclusion of the diffuse ephemeral and ethereal qualities of our experience, giving a place for meaning, intention, values, symbols and other aspects of what it is to be human.

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<sup>113</sup> Cilliers (1998), in *Complexity and Postmodernism*, is keen to make clear that with a pluralist perspective, modelling still has its place.

<sup>114</sup> As realist Pawson (2006:19) would in fact agree.

## ***Annex 6.1 Contrasting differing approaches to modelling tipping points***

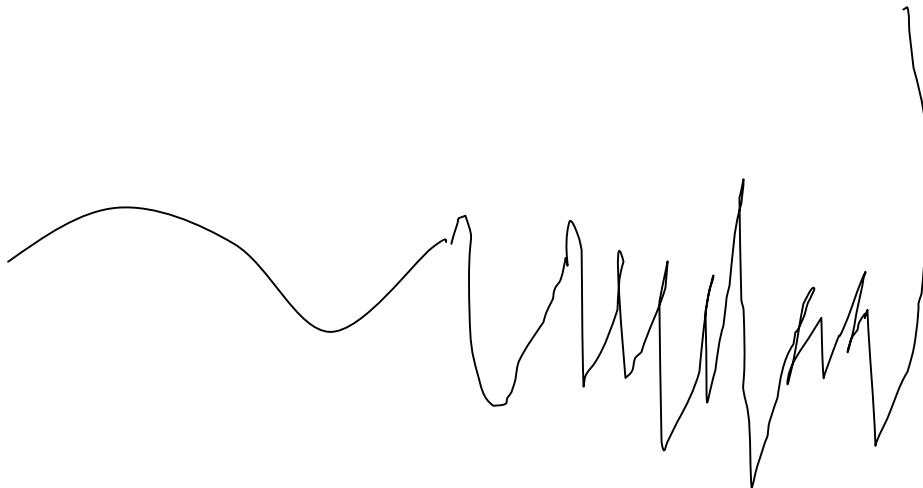
In this annex I explore the way our understanding of ‘tipping point’ depends on the sort of model that is used to describe or define it. This section is quite detailed and discusses the mathematics behind the model; it is not essential to follow the details of the argument. The main point is that, hidden behind the tipping point ‘window’ are, confusingly, several incompatible rooms!

I base my argument on the work of Scheffer (2009), primarily in ‘Critical Transitions in Nature and Society’. He draws on a number of models to look at the concept of tipping points.

The idea of a tipping point has become a well-accepted and well-used metaphor both in the complexity literature and also in the popular press. It is used to convey a point of no return, a phase shift, an irreversible transition to a new regime and/or a runaway effect such as a pandemic or societal collapse. Scheffer, Bascompte et al. (2009:53) define it as ‘a critical threshold at which the system shifts from one state to another’.

There are a number of ways of looking at tipping points and Scheffer (2009) initially describes four of these ways.

### ***1. Tipping based on chaos theory***



The first is based on the idea of a phase transition in a simple difference equation. These particular equations give a time sequence which is deterministic – i.e. unfolds in a predictable manner; hence the particular time sequence will depend on the initial conditions (as it will for all deterministic equations). For some initial conditions, the time sequence may be smooth for a while and then suddenly shift into a chaotic region where the behaviour looks random, like noise.

So this sort of tipping point is determined from the outset. Indeed some predict that the solar system will, in several million years, move into a chaotic phase, with planets zooming off into space.

### ***2. Holling's forests***

Scheffer's second example is based on Holling's work on forests. Holling (2002) shows how the resilience of a forest, due to the vast variety of species within it, gradually reduces as it matures as the



forest gradually loses diversity. So such a forest cannot easily be described by mathematics; a model must include both variation within a species and diversity (in the sense that there are many species) and must allow for emergence of new patterns; very few models can handle this sort of problem<sup>115</sup>. If a mature forest is affected by a shock – a fire or a tornado, for example – its reduced resilience means it is less likely to find a new balance and the forest may suddenly collapse. The way in which a forest will react to an external shock will depend on the diversity and interconnectivity within the forest.

This type of tipping point is caused by loss of diversity and consequent loss of resilience, coupled with an external shock.

### **3. Bak's sand piles**

Scheffer gives a third example. He describes Bak's (1997) work on sand piles. Bak looked at the way one last grain can cause a sand pile to collapse. Such modelling shows that the log of the size of the sand piles at the point of tipping versus the log of the ranking of the sand pile size is a straight line; this is a so-called power-law relationship which has excited many complexity people and developed its own literature.

### **4. Slow fluctuations**

Scheffer also shows how fluctuations in characteristics of the complex system tend to slow down and increase in magnitude just prior to a regime shift. On what assumptions is this finding based? Scheffer, Bascompte et al.'s (2009) paper in *Nature* does not in fact make these assumptions clear. They (2009:53) state that 'the dynamics of systems near a critical point have generic properties regardless of the details of each system'. But what sort of dynamics. He does not discuss this, but gives a reference to at this point in the paper, which is a book by Schroeder (1991) called 'Chaos, Power Laws; Minutes from an Infinite Paradise'. And he refers later in the paper to dynamical systems. So it is reasonable to assume, although this is not made explicit, that he is basing his conclusions on working with non-linear deterministic equations – of which chaos theory equations and equations used to look at sand piles (and their associated power laws) are examples.

## **Discussion**

Scheffer does not make explicit the differing assumptions underlying these differing perspectives on tipping points. Yet these very different assumptions suggest very different characteristics about 'tipping'. If you are trying to understand what complexity theory tells you about how to understand the world or how to react in the world, then each gives a different answer. The chaos theory example tells you that the timing and nature of tipping points is set by initial conditions; the forest example warns you that loss of diversity leads to a loss of resilience and makes you more susceptible to shocks; the third (Bak's sandpiles) suggests that the probability of tipping points can be known (consistent with the power-law relationship) if environmental factors are stable. The fourth shows how certain equations suggests fluctuations in qualities just before a tipping point, which can be used to know when tipping might happen.

In fact, I would argue that only one of these examples relates realistically to the human or natural world and that is the example of the forest. The chaos theory example, the sand pile example and the 'derivation of fluctuations' example each depend on simple equations with few variables; the first and

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<sup>115</sup> Allen and Boulton (2011) give a map, a detailed review of the differing types of complexity models and the assumptions within.

fourth are based on deterministic time sequences, the third assumes the sand piles are in stable environmental conditions and have reached a sort of equilibrium (akin to the assumptions economists make about the economy). Only Holling's forest is including in its description the variation and diversity that is a key part of the natural and human world.

But even Holling's example is not a general example of a tipping point as it requires an external shock to 'tip' the forest. A broader definition of a tipping point would be when one regime – that is, one set of patterns and relationships and characteristics – shifts into a new regime. This may be affected by external shocks, as with the forest example, or it may be affected by slower changes to the environment. Or the situation may be affected by internal shifts in relationships. It may be fast, it may be slow. It may be a 'runaway' effect or it may not.

## ***Conclusion***

My intention, in including this discussion in this thesis, is to work through an example of the way mathematical modelling, if we do not get to grips with its assumptions, can lead us in dubious and contradictory directions if we want to abstract learning from it. To state the obvious, mathematics simplifies the complexity of the human and natural world, and different approaches make those simplifications in different ways. Mathematic modelling can alert us to the likely existence of, for example, tipping points, but how we understand their characteristics will be coupled with the implicit assumptions within the model. Not all authors make these explicit. So mathematical models can guide our inquiry, raise questions, give a new language, but they are no substitute for exploring the empirical world.

## ***Annex 6.2 Complexity and the Social Sciences – article in IOP newsletter (Boulton 2010)***

This is an article I wrote about complexity applied to the social sciences. It was written for a physics audience. I include it because it encapsulates one of the themes developed in this chapter – the dangers of metaphor.

Stretching physics into social sciences has a long history. For example, the Marquise de Chatelet translated Newton's *Principia* into French and this resulted in Voltaire, her lover, publishing 'Éléments de la philosophie de Newton' in 1738 (Bodanis 2006). This was credited as the driving force behind the French Enlightenment's faith in reason and in grand design. It was assumed that the analytical method of Newtonian physics applied to the entire field of thought and knowledge. As economist Hayek (1958:229) says:

'it has been the rationalist, plausible, and apparently logical argument of the French tradition, with its flattering assumptions about the unlimited powers of human reason, which has progressively gained influence'.

The next physics theory to be commandeered was equilibrium thermodynamics, which formed the basis for economic analysis. Leon Walras (1874), in 'Elements of Pure Economics', as he was developing general equilibrium theory, said (Fullbrook 2009:4) '...this pure theory of economics is a science which resembles the physico-mathematical sciences *in every respect* [my emphasis]'. Notwithstanding the best efforts of economist Thorsten Veblen (1898), who, in 'Why is economics not an evolutionary science' plaintively asserted that there was no reason to assume economic systems reached equilibrium, no reason to assume Man was rational in his choices, no reason to assume the economy could be understood in terms of simple cause-and-effect relationships, such methods still prevail. This is despite the fact that many writers have pointed out that, to adopt a scientific theory for purposes other than that for what it was intended, does not automatically make it scientific. As economist Fulbrook (2009:4) says, writing of the classical economist Leon Walras:

'What matters to... Walras is not the methodological fit but rather the method itself.....instead of being led by ontological inquiry [i.e. starting with the real-life situation], he defines a priori the ontology to fit the method [i.e. asserts that the classical physics view is valid]. Nothing could have been more against the procedures and mindset that have dominated the natural sciences from Copernicus on [i.e. science itself would never work in this way].'

So what about complexity theory? Does complexity theory have something to offer social sciences or is there a risk of introjecting yet another physics theory and getting beguiled by it? There are certainly examples of worrying practices. For example, some early modelling work undertaken at the Sante Fe Institute (Waldrop 1992) showed a phase change in a cellular automata modelling problem. This 'edge of chaos' has entranced many social scientists. It has been taken to imply that organisations should try to emulate such an 'edge' between order and chaos as it has creative potential and thus will lead to success. More complex modelling would reveal a landscape of many more complex

features than a simple, single phase change, but this 'edge of chaos' has stuck (for example, (Brown and Eisenhardt 1998).

Another example that has caught the imagination of social scientists is the butterfly flapping its wings in chaos theory. The deterministic chaos of chaos theory is often conflated with the ordinary, normal variety of random chaos which, for example, Prigogine (1984) is referring to in his discussions about self-organisation and dissipative structures in his book 'Order out of Chaos'. Arguably, sensitivity to initial conditions is likely to be smoothed out in human complex systems such as organisations or economies, where qualities and characteristics vary across the piece: where there is learning, instabilities and shifts in the external environment: where there is diversity and historicity. For these reasons, parameters in differential equations rarely capture the complexity of humans and their behaviour and, equally, cannot easily represent the process of development and change. However the butterfly is used to point to the importance of specific, small events and creates a sort of heroism around the action or person who is credited with this vital instigation. Deeper considerations would suggest that what unfolds is likely to be due to a complex combination of history, chance, choice, interdependency and context.

So, what does complexity theory have to offer social sciences? One of its most important roles is that it offers a new ontological 'image', which has the potential to shift the dominant paradigm from that of the still-dominant mechanical world view towards a view of the world as interconnected: where variation cannot be ignored, where new eras and behaviours can emerge, where change is not predictable and understandable in simple single-dimension relationships. If we approached global warning from that complex perspective, for example, we would be more likely to emphasise that the process is not easily reversible, that the timing of any changes of behaviour have to happen sooner rather than later as the impact is not linear; that irreversible shifts into new eras where new factors emerge and others are destroyed, is both possible and likely.

There is a huge amount of interest in modelling social systems and different classes of model are based on disparate and distinct assumptions within the variety of approaches classed as complex systems thinking. Some focus on stationary states, some include noise and variation, some are agent-based, some include non-linearities but are closed systems. Evolutionary and complexity economics have their own literature and approach; there are models of cities and of traffic, of strategy and policy development, of leadership. Mathematicians and physicists are increasingly becoming interested in such human problems. These models can be very helpful in exploring the range of multiple possible outcomes; they can show what sorts of possible scenarios could occur, suggest and point to what might form the basis of effective interventions and policies and behaviours. They can help interpret the past and help throw light on how things have emerged. However, human systems are made up of people, and people make decisions for complex reasons; moreover, they learn, they interact and they live in complex environments which themselves are constantly changing. So, in approaching such problems mathematically, how do you decide what to include and what to ignore – particularly as, when phase shifts occur, that which was unimportant can suddenly become critically important? How do you account for diversity and for shifting contexts? This problem is usually well-understood by modellers, who are keenly aware of the limitations of their models and the tentativeness of

their outcomes; the problem often lies with policy makers and a public who expect certainty from scientists and have little time for uncertainty and for qualitative descriptions of possible scenarios.

So, I would argue that complexity science has a great deal to offer the social sciences as a new ontology; seeing the world as connected, diverse, contingent, emergent and not entirely knowable can be more useful and helpful than an optimistic and often misleading assumption of certainty and predictability. Wishing does not make it so. Complexity science has a great deal to offer as a way of modelling systemic problems in the social world, provided that policy makers understand that the map is not the territory and that such a map will be either fairly helpful or sometimes totally and wildly unhelpful.

But I would exhort social scientists who adopt complexity thinking to take the time to understand as fully as possible the derivation of the ideas and resist adopting a butterfly here and a power law there without being as clear as possible as to the underlying assumptions of the methods; otherwise, strange attractors may emerge and tip them over the edge of chaos!

## **Chapter 7 Is complexity useful?**

### **7.1 Introduction**

#### **7.1.1 Background to this work**

My explorations of science and theorising have influenced my relationship with complexity theory. I have been thinking and writing and teaching about complexity theory for over ten years. It has built on my science background, together with my practical experience in organisations through my work in strategy and organisation development and as Chair of two different organisations. So I have been able to test out theoretical ideas and framings and methods in the way I have engaged with organisations.

The work with the action research community has, equally, played a part in this developing thinking. In part it has caused me to question the way I see complexity; do I see it as ‘the truth’, or as one possible lens; do I see it as a science or more as a worldview; do I think it is realist or post-modern? The inquiry I describe in Chapter Three prompted me to question whether I ran the risk of seeing everything through its lens and hence missing what is actually there and actually happening and neglecting other sorts of framing. And, as I discuss in Chapter Two, and build on in Chapter Six, there is a strong link between action research methodologies and the ontology, the worldview, of complexity thinking.

#### **7.1.2 The focus of this chapter**

In this chapter I am focusing on my research in to how others engage with the ideas of complexity and in what way they see it as important and useful. The work was undertaken through a form of cooperative inquiry, starting with a day’s workshop in March 2009; indeed this inquiry group is still ongoing with a core of members who have stayed with the group over the last two years.

The majority of the material I work with in this research comes from the first three meetings of this group, and particularly from the first full-day session. In this first session I introduced complexity theory and then the group of thirty people split into smaller groups to discuss these ideas. I describe the approach in more detail in section 7.2.

The rest of the chapter describes and interprets what happened, what people discussed and in what ways it seemed complexity was ‘useful’. The chapter concludes with my reflections and learnings.

#### **7.1.3 A comment on methodology**

Part of the underpinning of my approach to this inquiry is that I deliberately did not formulate detailed hypotheses or detailed questions in advance. I wanted to work as much as possible in a narrative, learning-history style and to guard against presenting a retrospective tidied-up account which fitted with themes defined in advance. As I have discussed in Chapter Two, the open-ended approach I adopted both fits with the tenets of action research and is also congruent with complexity theory. It is based on the premise that you cannot really understand how things develop without recourse to the detail and to the history, the order in which things happen.

The result of this decision to work in this narrative way is that I present quite a lot of ‘raw material’ from both the lecture and from tapes of subsequent discussions. Most of this raw data is collected

together at the end of the chapter as annexes. I comment on this material, in text boxes or, when in the body of the text, through using a blue font, to indicate that I was reflecting on it at a later stage.

I recognise this approach is taxing for the reader as it is discursive and my hypotheses follow, rather than direct, the structure of the writing. I show my reflections and ways I start to draw together themes as I work with the material – not just presenting my fully-formed conclusions. So the conclusions to each section can seem quirky and unstructured and there is repetition. I have presented my reflection and conclusions in the way and at the point that they came to me, those things that struck me about the discussions as I listened to the tapes. Apart from my wanting to use a method which is reflective of a complexity theory perspective, working in this way invites the reader to share in the journey, to react to the material and my comments – as with a learning history, as described in Chapter Two. I do provide a more structured set of conclusions at the end of the chapter.

I have previously discussed, in Chapter One, the fact that the focus of this work was to ask whether complexity is *useful*. As the work described in this chapter developed, I have refined my view as to the *ways* in which it might be useful: as a description; as an irritant – to provoke wider thinking; as a guide for action.

It is also clear that, as the discussions which I describe in this chapter show, in order for them to be useful, it is important *how* complexity ideas are presented. Sometimes the methods I used or the examples I gave seemed to mislead rather than to clarify. So this issue – of what is useful and why and how it should be presented or engaged with – has been a fruitful thread to follow in this work.

## 7.2 The process of the inquiry

### 7.2.1 The steps I followed

In this section I will give a history of the steps I followed in setting up and organising the process of the complexity inquiry.

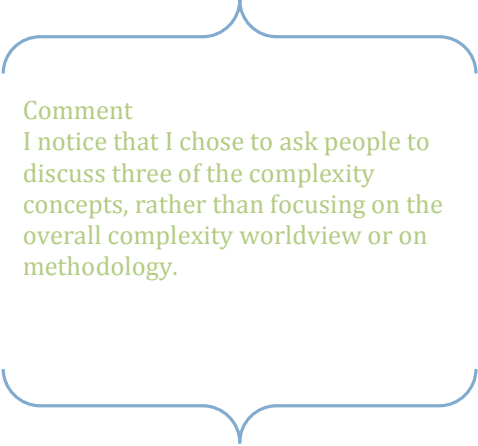
#### The advertisement

In March 2009, I advertised the running of a day's workshop on complexity. About thirty people attended and these were drawn from within the action research community, from others who have a particular interest in complexity, including other academics within the University of Bath. The briefing for the day is included as Annex 7.1. It is interesting to note that the briefing captures well the motivation I had in organising the day and the approach I followed on the day.

#### The process on the day

On the day, I gave a presentation about complexity – where the ideas came from, what they mean. This, together with questions, took until late morning. The slides for this presentation are given as an appendix, at the end of this document.

Then the group split into three, each with a facilitator. Each group was asked to inquire into a particular topic – specifically **tipping**, **emergence** and **self-organisation** – and asked to consider whether these concepts (one for each



**Comment**  
I notice that I chose to ask people to discuss three of the complexity concepts, rather than focusing on the overall complexity worldview or on methodology.

group) were ‘useful’ at the level of the individual, the organisation and, more globally, to society and to economies and ecologies. These sessions were taped.

## **Listening to the tapes and collating themes**

I then listened to these tapes and wrote a response to the discussions, in which I reacted to what was said as if I were speaking to the people involved. From this, I created a summary of what seemed to me to be the key themes. This summary is included as Annex 7.2. What I find very striking about this summary of themes developed quite quickly without detailed analysis is that it contained the majority of themes that I describe in this chapter, where I *have* worked much more systematically through the information. In particular, the development of this quick summary, Annex 7.2, helped me to differentiate between critiquing complexity as a *description* of the world and critiquing how taking such a complexity perspective may help to design and shape *action*.

## **A second inquiry day in April 2009 and a third in July 2009**

The next step was another inquiry, held in April 2009, which ten people attended and which was also taped. I presented my themes (Annex 7.2) to them and asked for response. We then held a further session in July 2009, which six people attended. The purpose of this session was to discuss how people were using the ideas, whether any further thoughts had struck them. This was also taped.

The sessions proved very popular and attendees were very keen to continue to meet to discuss and share ideas and practice about complexity. The group, now a core of seven people, has been meeting every three or four months ever since. In November 2010 I asked a few people to reflect on the whole journey – what had they gained from the inquiry and I report on this in section 7.6.

### **7.2.2 How I worked with this information**

In this chapter I want to show what emerged from these sessions. Part of the learning focuses on how the discussions have refined and changed how I – and others – think about ideas about complexity; does it seem that complexity is indeed useful?

Part of my learning in addition focuses on what seems to work or not to work in trying to convey these ideas to others, and in exploring them. What have I learnt about the process of engaging with others about complexity?

Finally, how would I now try to express the core ideas of complexity, given what I have gleaned from the whole process?

There was a huge amount of information to choose from in writing this chapter and I decided to focus on two of the three themes the discussions groups discussed: tipping points and self-organisation. I first looked at these separately and considered the question as to whether the discussion groups found them to be useful descriptions of the way things were, whether they were useful ontological statements. Then I combined the comments from all groups to consider to what extent the use of such concepts helped to shape action.

Finally I drew together my reflections and learnings.

These will be grouped under three themes:

- what did the inquiry convey in terms of how and whether complexity theory is ‘useful’



- as a description, (in particular, focusing on tipping and self-organisation) and
- as a guide to action?
- what did I learn about how to engage with people around this material; what seems to work and what does not; what do people hear in contrast to what I mean; what stays with people; the use of stories; does a different approach work for different people?
- does this work affect my view of what is at the heart of complexity theory; does it cause me to reframe or refine my worldview?

### **7.2.3 A retrospective comment on content**

I made particular choices as to what material I presented to the group and on what I questions I asked them to focus and it is interesting to reflect on this at a later stage. The whole lecture is included in the appendix. The first part of the lecture focused on complexity as worldview; compared complexity with pre-Socratic cosmologies, with Buddhism and Daoism, and with Newton's theories of mechanics. I presented the history of the development of complexity thinking and its relationship with evolution.

I then wanted to try something I do not generally do in detail when teaching and working with groups, and that is to try and explore and explain the meaning of terms such as emergence, self-organisation, tipping. I wanted to try and explain these complexity concepts as thoroughly as I could. I introduced the concept of state space, a well-used mathematical representation which gives an alternative way of providing information about a system other than saying what is happening in time and space. I spent some time doing this. I gave examples from ecology and from the original work on chemical systems. I tried to bridge the gap between the mathematical modelling of these concepts and what such models implied for the meaning of the terms. I wanted to see if presenting a detailed description helped – helped people to understand the terms, helped to make complexity useful.

What I then chose to do was to ask each discussion group to focus on one of the concepts – one for each group – and spend the rest of the time discussing their topic. What did the term mean? Did it seem useful in exploring issues from a personal, organisational and global perspective?

I note that deciding to focus the groups on particular concepts was an important and strategic choice. I was trying to explain the concepts at a deeper level, trying to go beyond light metaphor and really engage with how complex systems are likely to behave from the perspective of models (or, to be more precise, from the perspective of models that follow Prigogine's lead, in that they include the role of variation and the focus on evolutionary processes). And the groups did, in the main, stay with this focus, although one group, the emergence group, did have a rather more general conversation. So my motivation was about deepening the detailed understanding of concepts, rather than exploring more generally the implications of adopting a complexity worldview, which had been the focus of the first part of the lecture. I return to the implications of this choice at the end of this chapter.

## ***7.3 'Tipping point' as a useful description***

### **7.3.1 Introduction**

'Tipping point' is a key concept in complexity theory. I have already considered it in some detail in Annex 6.1. A tipping point conveys the notion of a shift in regime, from one state to another. It is also

used to signify runaway change or collapse but can, more generally, represent a more diffuse and contained shift – a shift in characteristics, patterns of relationships, qualities. In Annex 7.3 I show the slide I used in the part of the lecture on tipping points, and I also provide a transcript of how I spoke to this slide in Annex 7.4. I note that I spent a lot of time on a story about Nelson Mandela and the end of apartheid. And I spoke in some detail about the importance of values and ‘seeding the system with good ingredients’. I emphasised that it is easy to focus too great a degree on the *moment* of tipping, of change, and not focus enough on the importance of what goes on prior to this moment.

After the lecture the groups discussed these ideas and I include in the sections below excerpts from these discussions insofar as they related to the notion of tipping points. I reproduce an unedited version of the discussions about tipping points – in two of the groups – in Annex 7.5. I find the debate of great interest and really rich. I am struck by the extent to which people raised issues I had not thought of myself.

In this section I will focus on what the inquiry suggested in respect of the ways in which the term ‘tipping point’ provides a useful *description*. I distinguish the use of complexity as a description as opposed to a way of choosing how to act in the world; I return to this latter point, guidance on how to act in the world, in section 7.5. I will draw on examples not only from the discussions at the meeting in March but also from discussions at the subsequent meetings in April and July as well as comments made by email.

### **7.3.2 Why did the groups focus on ‘tipping points’ to such a degree?**

It is interesting, first, to ask why the group focused on ‘tipping points’ to such a degree. The discussion groups had been directed to consider three different themes, one in each group. These themes were ‘tipping points’, self-organisation’ and ‘emergence’. In practice, most of the discussions centred on ‘tipping points’ and, to a lesser degree, on ‘self organisation’. Hardly anything was said that related specifically to emergence. I wonder why this is. Maybe emergence is too loose a term; the other terms seem more like ‘things’, more concrete, more visual, perhaps, more easy to work with. And perhaps they convey the sense of some ‘thing’ in which you could intervene. Emergence, in contrast, perhaps conveys the idea of something happening over which you have no control. Or maybe the reason, more prosaically, is because, having listened back to the tape, I spent less time on explaining this concept and used fewer stories.

Maybe, in addition, part of the reason is that ‘tipping point’ is ‘interesting’? Mitroff and Kilman (1978:63) assert that ‘there are almost no examples of a Kuhnian scientific revolution<sup>116</sup> but nevertheless Kuhn continues to be cited at an ever-increasing rate’. So people remain ‘interested’ in the Kuhnian ‘tipping point’. In a similar way, Gladwell’s (2000) book ‘The Tipping Point’, remains a best-seller. And in April 2007 I heard ‘tipping point’ defined on a news programme as ‘a change that is inevitable’. And Steve Connor, the science editor for The Independent, has even gone so far as to explain terms such as positive feedback loops and non-linearities – terms central to complexity theory in general and to tipping points in particular. So this concept seems to be going mainstream.

Maybe some ideas are ‘interesting’ in their simplicity and elegance and the ease with which they can be grasped? So we like to work with them whether or not they are necessarily a ‘good’, ‘accurate’ description of how things are. And perhaps ‘tipping point’, in particular, falls into this category more

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<sup>116</sup> Itself an example of a tipping point

than ‘self-organisation’ or ‘emergence’? And maybe being ‘interesting’ is part of what makes it ‘useful’ – or dangerous?

### 7.3.3 Tipping points; what methods did people use to discuss this?

#### Use of stories

Much of the debate centred around taking the concept – tipping – and ‘interrogating’ it against personal stories. Margaret, for example, told the story about someone at work not saying ‘good morning’ one day and that that was the last straw and she decided to leave her job as a result. Sarah spoke about leaving her job in a multi-national organisation. She described the fact that a number of factors came together at once which, taken together, made it the right decision to leave. There was also a discussion about a story I had told about deciding to resign from being a trustee of a council. The discussion focused on whether my resignation was a tipping point in my life, in the sense that I left; or was it a repeating pattern, in the sense that this is what I tend to do.

People tested concepts by seeing if they fitted with experience. And I, in the lecture, illustrated concepts through stories (and this took up a considerable amount of my tipping-point discussion time) and these stories seemed useful too, in that people returned to them. Indeed Peter commented later, in an email:

*‘What was also interesting was the way the stories Jean told by way of illustration were in some ways as important as the theory ideas themselves. They were certainly easier to grasp and hold in the mind.’*

#### Discussion using more abstract terms

Not everyone used stories as a way to reflect on the material. Some parts of the debate were more abstract and played around in conceptual terms with the ‘notion’ of tipping – is it a moment in time, could it be slow, did it imply a ‘ping’ as Margaret said, or could it be flowing? Could situations tip back? And how did you know when something had tipped? Can things always tip or only sometimes? Is it the case that we are part of a ‘community of patterns’ and maybe some of these patterns may tip and some may not? You can almost imagine, in these comments, how people were holding a picture in the mind – of a pivotal point, like a see-saw, or an exponential curve that took off (which is the way Gladwell (2000) presents it) or a door to walk through or a tidal wave – or a ‘community’ of interconnecting rings. I found this part of the discussion particularly stimulating and thought-provoking.

Valerie had really taken on board one point I had been keen to emphasise – that the indication of tipping is the fact that the initial state and the final state have different characteristics. She said:

*‘You know you have tipped because your life has become very different. New things become possible; tipping point is defined by the change of state. You could be divorced and it might not be a tipping point. You can’t be sure what made the difference, but you can identify a state change. We know things are different because things become possible that before you never would have thought of or never done.’*

This creates less emphasis on what happens at the ‘moment’ (if there is one) of tipping. But, this description, useful as it is, is still not unambiguous. As others pointed out, how do you decide whether

a 'state' has changed? Does everything change, or only some things? How many of the qualities of the system have to change to decide it is a 'tip'? Over what timescale do you look? As Mark said, *'you might say Totnes has tipped in relation to taking climate change seriously, but has the South West?'* Over what timescale do you look back and decide there has been a change – and whether that change is incremental or truly a change of state?

When I listened to the tape of the discussions, I was reminded of Beer's (1983:8) comment, already discussed in Chapters 2 and 5, on evolution:

'[Evolution] cannot be experimentally demonstrated in any present moment.'

Listening to these discussions, where people grappled with the concept of tipping, was very significant for me. It really demonstrated how layered and complex and nuanced such concepts can be – and how potentially misleading. It made me feel that we should hold such concepts lightly. We should not limit our thinking and limit the attention we pay to actual experience by giving such terms too much power to frame what we think or for what we look.

### **Tipping as expressed in other philosophical traditions**

Some of the discussion also related the idea of tipping to other traditions, in particular Buddhism and Taoism. Peter, for example, talked about the Dao de Jing (Ames and Hall 2003). This Daoist view suggests that the door (for change) is sometimes open, sometimes not. This is similar to the sentiment expressed in Julius Caesar (Act 3, Scene 3):

'There is a tide in the affairs of man,  
Which, taken at the flood, leads on to fortune:  
Omitted, all the voyage of their life  
Is bound in shallows and miseries.  
On such a full sea are we now afloat:  
And we must take the current when it serves,  
Or lose our ventures.'

Peter also raised the Buddhist notion of emptiness – the importance of seeing tipping as a way of talking, and being careful of 'misplaced concreteness' as he called it. Tipping points may or may not occur; they may describe what is happening or not. What actually happens is complex, multi-faceted, hard to know. Tipping points are not 'real' in an objective and concrete way.

### **Differing learning styles**


So it is interesting to see that people have different preferences in handling theory; some work with stories, turning the theory into something practical; others undertake thought experiments and imagine the implications of the theory in the world; yet others compare this theory with other theories. This is consistent with the discussion in Chapter Four where I considered evidence of how scientists and others develop and test theories. It emphasises for me that, as a lecturer or facilitator, I must pay attention to this: how to engage people with a range of ways of knowing and learning so that there is appeal to differing learning styles.

### 7.3.4 Tipping and retrospective coherence as an example of miscommunication; retrospective coherence is not part of complexity theory!

As I explained during the lecture, any retrospective ‘telling’ of something that has happened is inevitably flawed as one inevitably chooses what parts to select or ignore, depending on what seems relevant to one’s own perspective on the story and what creates a sense of coherence. Complexity theorist David Snowden (2002) warns of the dangers of seeking retrospective coherence, of seeing causal links in the back story that suit our narrative. And Lewis Wolpert (1992), the biologist, suggests that this desire for causality is probably a necessary characteristic for an animal that moved forwards through making tools; you have to be able to imagine that tools will cause an outcome in order to design them; Wolpert’s point is that to assume or desire causality does not make it exist.

This theme – of retrospective coherence – emerged strongly in the discussions, particularly in one group. What I had conveyed in the lecture was that we often, in looking back on a problem, construct a logical rationale as to why things happen. So, if we want to say why a relationship ended, or why mammals gained the ascendant, or why the Berlin Wall fell, or why we studied physics, it is easy to look back and ‘see’ or post-construct patterns and cause-and-effect chains.

The point I was trying to make in the lecture is that, in reality, an awful lot of things happen which can contribute to an outcome, including some excursions where things fail or die and we forget – or are unaware – that they happened. For example, in understanding why mammals gained the ascendant, the simple, tidied-up version is that the dinosaurs could no longer cope with a climate changed by an asteroid and therefore died out, and so the little rat-like creatures that were more resilient to colder climes survived



This section is important as it is an example of how what I meant to convey in the lecture is not always what people heard. I was very struck by the difficulty I had to convey what I meant about retrospective coherence

and started to dominate. But what may have happened, for example, is that another creature took over for a while and then died out and it was the particular sequence of events – the particular order in which things happened – that made it possible for the rats to gather strength. In the same way, if we look back to a committee meeting, we may have a particular view as to why certain decisions came to be made. If we listen to a tape of that meeting, we may find there were events that we have forgotten that contributed to the decision, such as someone leaving the room at a particular moment, or the tone in which someone else made a contribution to the discussion.

So the point I had been trying to make in the lecture is that complexity theory, as with action research, emphasises the importance of the complex particularity of what happens; this idea that there are multiple and overlapping and indistinct causes is best thought of as path dependency or cumulative causation.

My intention in the lecture was to try and express the fact that retrospective coherence is *not* part of a complexity view. The discussion in the group, however, continued on the assumption that I was asserting retrospective coherence *was* part of a complexity view. One person in particular kept making the point very forcibly that retrospective coherence does not fit or explain complexity theory, as if I had said the opposite.

This view that I was indeed connecting complexity and retrospective coherence took on a life of its own and even when I intervened in the discussion and re-stated what I had meant, it seemingly made no difference. Indeed, when we met in April, Jim mentioned this discussion – and the fact that retrospective coherence was an aspect of complexity theory – as one of the key things he remembered from the day. Again, at the April meeting, I attempted to explain what I had meant, and you can hear from the responses on the tape (i.e. that people sort of nodded to it, but no one really responded to it, as if I had not spoken) that, once again, it made little difference. I failed to communicate what I had meant; the words had taken on a life of their own.

Having said this, the discussion did bring a very important point to the surface, which is that if you try to ‘see’ a tipping point retrospectively – identifying where it was and how it happened in retrospect – your understanding will inevitably be flawed, for the very reason that much of the detail is likely to be lost or forgotten as you look backwards. You can’t really be sure what caused it.

### **7.3.5 What did I learn from this work with tipping points?**

#### **Stories – their power and their danger**

The methods we use to hold concepts in our minds and ‘play’ with them are different for different people. Many interrogate concepts against examples and stories; some also explore concepts in more abstract ways. But responding to stories and using stories was the dominant process. As Peter said, the stories I told were as important as the ideas they conveyed. So, in the sense of trying to engage with people around this material, then it puts a responsibility to select stories that are helpful but also not contrived. Otherwise it is like advertising – easy to pick stories which suit what you want to convey, rather than stories which are ‘truthful’ and complex and meaty enough to bear interrogation.

Equally, you could argue that finding or creating a story, which may be contrived or tidied-up, but which is true to the theory, may be a better way of conveying theoretical ideas than explaining the theory itself. So if I am clear with the audience that the story is designed to be congruent with my view of the theory and my view of what the theory implies, it may be clearer to give a contrived ‘designed’ story than to give a messy ‘true’ story. If I use a messy ‘true’ story, it can be unclear as to which bits of the story I am inferring capture the theory. Perhaps the approach should be to pick contrived stories to elucidate the meaning I am intending to convey and then ask the group to consider real stories to see if the theory stacks up.

#### **Inevitable metaphor**

Secondly, the discussions bring home to me how easy it is to adopt a concept and use it rather blindly. I had not expected to conclude that I also guilty of this. But this work shows me that I myself have not sufficiently thought through some of the nuances as to the nature of a tipping point and how you can know whether ‘tipping’ is happening or has happened. It brings home to me how easy it is merely to drop the common Newtonian concepts and replace them by others – but still treat the new concepts as real, concrete, objective, unambiguous ‘things’ – even if you think you are alert to this pitfall!

It also raised for me the question as to whether it is acceptable and indeed even helpful if people misinterpret what I mean. It may still lead them to explore the world in a fresh way, provide new metaphors and images to play with. And it is of course possible that it is my misinterpretation, not theirs!

What I am forced to conclude is that, despite my antipathy to metaphor as discussed in Chapter Six, I cannot really escape from the fact that the terms I am using *are* metaphors. I might be attempting to ensure that these metaphors are true to the ‘right’ (I say this ironically) interpretation of the theory, are clear, are (in my view) congruent with the nature of the world – but terms such as ‘tipping point’ *are* metaphors. Reality does not conform neatly to such a description in general terms. So ‘tipping point’ may be a ‘good’ metaphor, and a ‘useful’ metaphor in the sense that it provides a better understanding of the world than to imagine the world as a machine, in tune with Newtonian concepts. And it may provide a more helpful way of deciding how to act in the world – i.e. not to assume change is reversible and controllable. But it is, nevertheless, a metaphor!

### **7.3.6 Having undertaken this inquiry, how would I now ‘improve’ my description of a tipping point?**

I would say that this list is not different in kind from the list I used in the lecture, reproduced in Annex 7.3, merely crisper and less ambiguous. So the discussion did not fundamentally change my view, just helped me to improve the precision of my language.

#### **Tipping points**

- a major shift in regime – with new patterns of relationships - not in general incremental or reversible
- characteristics which were unimportant in stable times may come to the fore during this regime shift – so analysing the present will not in general give information as to what will emerge or how it will emerge
- it is important to focus on what you are putting into the system, how you are encouraging ‘good’ ingredients and ‘required’ values and behaviours, and not just to focus on the point of ‘tipping’
- situations are not always on the point of tipping; the door is not always open
- it is hard to know, in the moment, whether changes are, in effect, fluctuations and will stabilise again, or whether they signify a more radical change of state
- At the point of tipping, there is more than one possible future, more than one possible new regime

## **7.4 Self-organisation as a description**

### **7.4.1 Introduction**

In the previous section, I considered the comments made in the discussions relevant to the notion of ‘tipping points’. In this section, I focus on how the concept of ‘self-organisation’ was handled in the discussion.

In the annexes to this chapter, I set out some of the material I used in the lecture to introduce self-organisation. I include, in Annex 7.7, an illustrative story, about a fictitious pond, to demonstrate self-organisation in action; I include, in Annex 7.9, a transcription of my explanation, given in the lecture, of self-organisation and self-regulation; and I also include, in Annex 7.6, the slide that accompanies

this topic. This material allows a comparison between the ensuing discussions on these topics and what was actually presented.

I also include, in Annex 7.8, a transcript of how I introduced the idea of state space and attractor basins. State space is an alternative description of events which happen in time and space, akin to representing music on a spectrum analyser rather than listening to the sounds in time. The information contained in the description is the same. Using state space provides an alternative perspective, an alternative way of understanding self-regulation (wobbling within an attractor basin) and self-organisation (moving from one attractor basin to another). I define these terms within the transcript as they came up in the group discussions.

### **7.4.2 Discussion about self organisation as a *description* of what happens in the world**

Some of the discussion in the small groups about self-organisation focused on how you can influence change (rather than on whether self-organisation was a good description of how things are) and I will return to these comments in section 7.5 and focus in this section on how self-organisation was perceived to stack up as a *description* of situations in the world.

In what follows I illustrate some of the discussion that went on in the small groups about self-organisation and then comment on it as I read it later.

#### **Locked-in patterns**

One theme to which people kept returning was whether self-organisation is a helpful description of what happens to individuals (as opposed to organisations or economies). One theme related to the issue of locked-in patterns.

It was mentioned that patterns in family dynamics and in organisational dynamics can be sustained even if people leave the organisation and new people come. Equally, we can get locked in to family patterns. Do we overcome them, do we sometimes overcome them and then slip back, do we think we have overcome them but others think we have not? *‘Maybe we are a community of patterns, some of which are dominant at certain times, some of which change but others which merely go into abeyance,’* as Peter said. Peter went on to give the example of CD who had survived a difficult childhood through adopting certain behaviours. Does the strength of that survival pattern make it harder to forge into a new pattern as we engage with the world?

Peter gave another example of Laing’s<sup>117</sup> work with families; how a new family member often is expected to take on, or finds herself taking on, the characteristics of someone who has died.

As I reflect on this later, this discussion reflects an important issue that I need to make more explicit in discussing self-organisation and self-regulation. When a pattern has emerged – that is when a pond or organisation or economy has self-organised - the pattern can have varying degrees of resilience. Strongly resilient patterns are said to be locked in.

Bion’s (1961) theory of groups captures the same notion; that if someone leaves a group in the case where there had been dissent, it is often the case that someone else becomes the scapegoat, the

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<sup>117</sup> R D Laing (1965)



recipient of that dissent. In other words the structure in the group remains, just the players change. And Jung's (1963) idea of archetypes is also consistent with this sense of locked-in patterns.

In fact, the theme of 'lock-in' has been developed very thoroughly by one complexity economist in particular, Brian Arthur (1994:2). Arthur emphasises that what happens, what particular pattern 'locks-in' depends on the particular path the system has taken, on the particular history. He gives the example of the battle for supremacy between Betamax video tape and VHS. Betamax was the better product, but VHS became successful through its developers persuading manufacturers to adopt it as a standard and persuading the public to choose it through use of substantial marketing power and, as Arthur says, 'luck'.

So the group was homing in on an important point. It is easy to think of self-organisation as if commences from a neutral starting, a level playing field of random pre-existent connections. In practice there are always pre-existent patterns which have previously organised and any new intervention may invade these structures and tip them into a new set of relationships – or may not.

## **Differences between human and non-human systems**

Margaret was concerned that it was a bold assumption to infer that what is true for physical or even natural systems is true for human systems.

Arthur picked up on the comment in the lecture that self-organisation is about some relationships getting stronger while others get weaker. He made the point that, as humans, we can act and deliberately *intend* to strengthen some and weaken others; we can act to change patterns even if we do not get what we intended. We can act to embrace diversity and act to sustain the potential for connecting – and choose not to seek to standardise or create divisions. How does the notion of self-organisation change when you add in the intentionality and conscious action of humans?

This is a very interesting and important point about which there has been much debate. Human beings can analyse, reflect on, affect, shape, modify, and construct the social systems and natural systems of which they are a part. This is clearly different from being a molecule in a chemical solution. And the initial work on complex systems focused on the inert physical realm. Prigogine (Prigogine, Allen et al. 1977) himself was quite aware of the issue and wrote about it. In brief, human action and intention are factors, just like any other factors to consider; they can amplify the dynamics of the situation or damp them down. But I would argue that the inclusion of factors such as intention or action does not change the ontology of the process of self-organisation, it just changes the detail. This is a non-trivial issue however and I return to it in section 8.5.

## **Self-organisation versus self-regulation – confusion**

The story of the Bath pond brought out a discussion about the difference between self-regulation and self-organisation. Margaret said: *'I thought that it implied it was something nice that happened in a complex system and that only happened in a complex system; I was surprised when Jean said it always happens, it is not good or bad or beautiful; and that you can get stuck in one self-organised dynamic pattern. And I was confused as to whether you got one pattern or many, like many swirls on the cream on a coffee.'* Fran then gave an example of a collection of cells being able to organise itself into healing if attacked and Mark said that was self-regulation. Peter then intervened to say that he thought that self-organisation is, for example, the emergence of species or the capacity to do it; self-regulation is the doing of it.

There was then a conversation about the fact that self-organisation results in structure that does not come from a blueprint and is due to local interactions, not designed. I would agree with this!

Margaret kept coming back to my statement that self-organisation always happens. Does that mean that ‘no pattern’ is self-organisation or that smoke going up a chimney is self-organisation?

In fact, what I had meant by what I said is that the processes of connecting and disconnecting, of shifting on the micro-level is *always* happening in complex systems. And by complex system I mean systems with many diverse interconnected relationships between elements – such as a forest, or pond or human organisation. Whether a new form emerges (self-organisation) or the overall pattern remains the same (self-regulation) depends on the extent to which the system is stable – i.e. whether it is – or is not – near a tipping point. So Fran’s example of the multi-celled animal is about self-regulation and Peter’s statement that self-regulation is the process of self-organisation is not what I meant to convey, not in line with how I see it.

I am describing here a very confusing discussion where people try to make sense of what I had meant in the way I had described self-organisation versus self-regulation. There is a lot of learning for me here – both in terms of how I can be as clear as possible, but also that people will make sense of what you say in terms of their own knowledge and opinions. Such ideas cannot be conveyed in too short a space of time and need discussion and reflection.

Margaret had asked, ‘Is smoke going up the chimney a complex system and is it self-organising?’

In general I would argue no, as the system is simple and in general any smoke pattern is momentary, does not settle down, has no dynamically-stable, reflexively-held form. But I notice how Margaret works with the concepts and tests them to extremes. This is very helpful and makes me feel I do not always do this enough.

Mandy then gave an example of someone suffering a bereavement; would we say that that person self-regulates and stays the same or would we say (s)he self-organises and changes as a result of the bereavement?

As I heard this later, I was struck by how easy it is not to be clear. Not all things that do not change are self-regulating; self-regulation conveys more the idea of resilience to change where the resilience comes about through small variations and there are lots of elements and relationships – i.e. lots of degrees of freedom. Not changing as a result of bereavement conveys more the idea of stuckness, of rigidity. So I have not explained this sufficiently clearly.

Margaret returned to her example of leaving her job and how over several months she got more disillusioned, and it was a slow process of cutting ties. Fran commented on this and said that ‘*for those months there were other things happening in the state space which caused turbulence which lifted you out of the attractor basin but which did not take you anywhere else*’. She likened it to having ornaments on the bed; you jump on it, they lift off and at that point they are in limbo. ‘*At that point*’, she said, ‘*you are at a bifurcation point, you could go left or right, up or down; and things are in continuous motion. Chance will play a part as to which way you go; but tipping is not choiceful*’.

I thought Fran's description was a pretty accurate representation of what self-organisation and tipping are all about. It does, perhaps, give primacy to the point of tipping; and whilst I would agree that tipping is not choiceful, what you do earlier can be choiceful.

So this discussion is a good example of the sort of discussion that occurred; confusing at times, rich, with people trying to make sense of the concepts and explanations I had given.

### 7.4.3 What have I learnt from this inquiry into self-organisation?

#### The potential for confusion – and the need for discussion

I had really wanted, in the lecture, to convey as far as I was able, a description of self-organisation in a detailed way. My description was based on the understandings gained – in general terms – from mathematical modelling. I wanted to show how self-organisation is understood through such modelling and then see if such descriptions seem congruent with real experience. I wanted to get beyond a surface understanding of these terms, try and go 'beyond metaphor' – or at least beyond sound-bite.

I think the discussions fulfilled my intention in that people both sought to understand what I had meant, what self-organisation means according to what I conveyed – and also asked themselves the extent to which the idea of self-organisation resonated with their practical experiences.

What the discussions did show me, though, is how difficult it is to communicate mathematical concepts in this way. And how realist and concrete the descriptions can sound. When Fran says '*there were other things happening in the state space which caused turbulence which lifted you out of the attractor basin*', I felt both pleased she is grappling with it, pleased she is getting it, and also arrested by the language – it sounds a bit formal and does cause me to question whether it is helping the gaining of understanding. Is it 'useful' to describe things in this way? Does it convey anything new about the world, or is it just a new language?

In particular, I keep wondering whether it really helps to discuss and introduce the concept of state space. But, as the term 'attractor basin'<sup>118</sup> is in common usage, it is hopefully helpful to try to bring a little more rigour into understanding what it means from a mathematical perspective. The term is often misunderstood and people talk as if attractor basins exist in 'ordinary' (rather than state) space, so it does seem important to include it. But I do ask myself whether, for example, the explanation given below by Prigogine, which does not use the language of state space, is sufficient. Prigogine and Allen (Prigogine, Allen et al. 1977:2) said<sup>119</sup>:

'An important element in the behaviour of systems in far-from-equilibrium conditions is the presence of 'feedback' – interactions between the elements composing the system (molecules in chemistry, cells in an organism, individuals in society). If such interactions exist, then it is found that for a *certain critical flow of energy or matter* in or out of the system a new type of structure or organisation may occur spontaneously. The structures resulting in these circumstances are entirely

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<sup>118</sup> An attractor basin is a preferential constellation of states to which the system will often drift or return and when there, will remain.

<sup>119</sup> This is not to suggest that Prigogine and Allen did not also adopt the language and methods of state-space, which they did.

different from an 'equilibrium' structure such as a crystal. A crystal, once formed, needs no further contact with the environment in order to persist.'

Their explanation does seem very clear. Nevertheless, my reason for wanting to explain state space and attractor basins is that it gives people a deeper basis from which to approach and critique others' writing in this field. Otherwise, one is left with the choice of either to take the ideas on board as a whole, or to reject them as a whole. But it seems clear that I need to give more time for explaining and exploring such concepts and perhaps provide more background material.

In listening to tapes of the discussions, I felt it would have been great to join in – or at least I wish I had given more time for questions and discussions in which I was included, within the day.

### **Margaret's approach – testing to 'destruction'**

I am particularly struck by Margaret's approach from which I have gained a great deal. Margaret, as I have shown, tends to test concepts 'to destruction', tends to look for the absurd in the statements, and sticks very strongly to a discussion about what happens in the world. Her approach brings home to me how potentially unhelpful the sort of material I presented can be. I feel increasingly concerned that people can just adopt a new language and set of concepts but apply them in a realist Newtonian way – and still do not pay attention to what is actually going on. And the issue of what it means to be human, what a human system is or does is a very important point to discuss. And of course it is important to be careful in using the word 'system' as it can also turn into a fixed 'thing', another reification. Her comments, more than any others', have made me more conscious of the language I use when discussing complexity thinking, and have helped me to be more careful not to reify terms, to be aware if I speak in realist language – and, if I do, to name it as such and point out what such an approach excludes.

### **7.4.4 So what do I now feel is a useful description of self-organisation?**

I have discussed what I learned from the discussions in terms of the process of teaching and co-inquiring about these themes. In terms of the *meaning* of self-organisation, I am now asking whether the discussions caused me to rethink how I see self-organisation and what words I would use to describe the concept.

### **Patterns of relationships**

Complex systems – i.e. situations where there are complex relationships between diverse elements e.g. ponds, the earth, organisations, societies – may, and indeed are likely to, develop patterns of relationships which persist for a time but cannot be predicted or controlled. As was said in the discussion group:

*'Self-organisation results in structure that does not come from a blueprint and is due to local interactions, not designed.'*

And by patterns of relationships, I mean such things as the supply-demand relationships of economics, or the which-species-eats-which relationships in ecologies, or the combination of informal and formal sets of relationships in organisations.

These patterns may be stable for a time, but are not fixed forever; their stability can be affected by changes from outside or changes from within. And the nature of the current patterns gives us little information as to what relationships might next emerge.

The particular patterns that emerge will be created by a mix of history, chance, external or top-down interventions as well as shifting relationships within the body of the system. Top-down interventions cannot ‘make’ something specific happen, but they will have an additive impact on what does happen.

## **Conditions for resilience**

Complex systems will be more resilient to external forces if they are diverse and also have the propensity to shift connections. So, for example, a recent television programme about the Scottish Highlands was explaining that, because parts of the Highlands had lost their eco-diversity, they were not able to regenerate. An ecology survives better if, as one species reduces in number, its predators can change to eating another species, leading to a wholesale change in the web of relationships.

## **The door is not always open for change**

The theory also embraces the notion that ‘sometimes the door is open and sometimes it is closed’. So sometimes it can be hard to shift a system – it gets locked-in to a pattern (which may be ‘good’ if we are talking about the resilience of the earth or may be ‘bad’ if we want to shift the values of the consumer society or reduce the power of one global manufacturer); at other times, the system may be poised for change and may shift relatively easily into a new form – although that new form may either be beneficial or not. So there is nothing necessarily ‘good’ about self-organisation; it is just an aspect of how things happen.

It is hard to know whether we are near a tipping point, when the door is open, so we cannot know whether actions have vital immediate importance or whether we are merely gradually nudging the system or slowly changing the ingredients and relationships.

## **Path dependency**

The particular pattern that becomes locked-in can depend on the particular path that a particular situation followed. So the particularity and order of actions and activities can be important in what emerges.

## **Comparison to the lecture**

When I compare this description of self-organisation to the way I presented it in the lecture, (in Annex 7.6) I do not think I have substantively changed my description, but I think the above description is less ambiguous, more precise.

## ***7.5 Complexity theory as a useful guide to action***

### **7.5.1 Introduction**

In the previous two sections, I have considered and drawn together what the groups discussed in terms of whether certain terms in complexity are useful as *descriptions* of our experience in life. That is to say, do these terms say anything helpful about how things ‘are’ in the world, and about how things change?

In addition, the groups also discussed whether the terms were useful in helping us decide how to *act*. In this discussion about action, the themes from tipping and self-organisation overlapped much more, so I will not distinguish them in this section.

The kinds of questions people asked were:

*Can you move things to tip in the direction you want?*

*Can you notice when something is nearing a tipping point and do something about it (either help or hinder)?*

*Can you ‘aid’ or ‘nudge’ the self-organising process to avert disaster or achieve something in line with what you think is helpful? Or should you just ‘trust the process’? How do you ‘put good ingredients into the mix’?*

In the next sections I look at particular themes that emerged in the discussions in relation to planning action.

There was a short, but important discussion as to how complexity thinking influences organisation strategies – to enhance creativity and to develop business strategy. I discuss this briefly in section 7.5.2.

Then there was one key, underlying theme in particular that dominated the discussions about action; this focused on the tension between intention and emergence. Should you act in a focused way to influence what happens or should you trust that what will emerge will be appropriate? I consider that theme in some detail in section 7.5.3.

## **7.5.2 Business strategy in a complex world**

In Jim’s group in particular there was an interesting discussion as to how organisations can set the conditions for success – both in terms of encouraging creativity and in terms of developing successful business strategies.

The group grappled with the complexity of strategy in a complex world – a need for a portfolio of strategies (as it is difficult to know what will work and what will not), a need to spot opportunities, a need to build on what does work (and so spend time reviewing progress). There was discussion about using blue-sky and fore-sighting techniques, to try and promote thinking about possible futures; and ways to share knowledge.

The group also discussed ways to enhance connectivity and creativity in organisations. Paul said that Google allow people twenty per cent of time to work on their own ideas; he mentioned another company that do something similar and allow people to have free drinks but only at certain times. These actions enhance the potential for collaboration.

Glenn mentioned Christensen’s (1997) book, ‘The Innovator’s Dilemma’. In this book, Christensen suggests that some innovations are merely extensions of what has gone before. But when something is radically new – a ‘disruptive technology’, as he calls it – then market research and planning are not much help, as people do not always know whether they would want something when it is so different that it changes society and the social norms. Innovations such as the internet or text messaging (or indeed refrigeration, in its time) are examples of this. So how do organisations select disruptive

technologies, then ride the wave of their emergence without, as Christensen says, ‘betting the farm’? This example sits right in the middle of this ongoing dilemma of intentionality balanced with responding to what emerges.

As Mark said, perhaps the greatest utility of complexity as a concept is that it reminds us that we cannot just extrapolate from what has happened in the past in planning change or developing strategy; we cannot just take an average, statistical look at situations in order to understand their salient features; we cannot assume that, if it works here, it will work there. Mark said *‘it tells you what the world isn’t rather than what it is’*.

### **7.5.3 Intention and emergence**

This theme – of the balance and tension between trying to influence what happens in some way and, equally, responding to what emerges – is one of the key themes to emerge from the work of this thesis. It seems central to considerations within economics (should we have a free market or regulate), management (should we create structures and strategies or focus more on empowerment and responding to opportunities) and daily lives (should I push for what I want or wait and see what comes my way). This section both pulls together the material that came from the discussions and includes my own examples and reflections as I myself consider this tension. I return to this theme in section 8.7.

#### **Paying attention to what ‘ingredients’ you introduce into the system**

One of the ideas I had been at pains to convey in the lecture is that attention is often focused on the idea of the tipping point itself, but what happens *at* that point depends on what has happened *leading up* to that point. The focus on the point, the *moment* of tipping can preferentially place attention – or expectation – on some sort of heroic action or event or ‘last straw’.

One example of this was given to me by a friend who was CEO of a charity working with disability in Africa and Asia. She told me that sometimes you could do work in a new country, where the issues of disability had never been raised. You might do wonderful consciousness-raising work but have little to show for it in concrete terms. You might have to give up due to funding difficulties because there were no demonstrable outcomes. But the next agency coming into the country working on the same themes, may be met with greater receptivity, more support, more tangible success. This second project may seem to be really successful – but in fact it had built on your previous work and it was the two projects together – and indeed other factors too - which had led to tangible and successful outcomes. What this example demonstrates is that we cannot just understand what caused the successful change by considering what was happening at the point where change was visible. It is necessary to take a more historical and longer-term view in order to understand what led to the change and not make a hero out of the agency that was active at the moment of tipping.

I had suggested in my lecture that what we should do, in terms of either trying to avert ‘bad’ tipping points (such as climate change) or promote ‘good’ tipping points (such as a move towards a more equal society), is to seed the system with ‘good’ ingredients. This is of course a very moot point and, as Paul pointed out during the lecture, (a) how do you know what is ‘good’ and (b) it is also possible that acting ‘badly’ could still propel the system to a critical transition from which ‘good’ could come. This could lead into a whole discussion about moral action – is the morality in the act (as Kant would

argue) or in the outcome (as Bentham would say)<sup>120</sup>. Complexity theory, I suggested, would infer morality should be focused on the act, in the sense that the outcome is always subject to variation, self-organisation, uncertainty of various kinds.

This focus is resonant with the Buddhist theme of 'right action'. And it relates to a similar theme in the Romantic Movement. Isaiah Berlin (2000:9), for example, says:

'The values to which they [the Romantics] attached such importance were such values as integrity, sincerity, readiness to sacrifice one's life to some inner light... You would have found they were not primarily interested in knowledge, nor political power, not happiness, not interested, above all, in adjustment to life. You would have found that common sense, moderation, was very far from their thoughts...they believed in the value of martyrdom as such, no matter what the martyrdom was martyrdom for... the state of mind of a man who is prepared to sacrifice a great deal for principles or for some conviction, who is not prepared to sell out, who is prepared to go to the stake for something which he believes, because he believes it.'

Berlin is describing an approach which places primacy on the quality of the action and the importance of the underlying intention in the action rather than taking a more pragmatic, political view as to what might be effective.

Another example of a related approach is described by Richard Hoggart (1957) in 'The Uses of Literacy' where he explores the culture of the working classes, particularly in the north.

Hoggart says (1957:117):

'The emphasis is always on what it is right for them to do, as people; people who do not see the point of 'all this dogma', but who must constantly get along with others, in groups; people who must learn how to cooperate, how to live on an exchange basis, how to give and take... they do not think much about sin and grace, good and evil but they are sure there is a difference between right and wrong. Ask working-class people what they understand by religion and they will be likely to answer:

Doing good

Being kind

Doing unto others as y'would be done unto

We're 'ere to 'elp one another

Learning to know right from wrong.'

There is intention, purpose in this behaviour, yet it is pragmatic in the sense of getting along with people, but it has an immediate quality to it, not a long-term plan with long chains of planned actions and long-term goals. It does not suggest that the end justifies the means. I note the connection with my own background in being attracted to such an approach to life.

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<sup>120</sup> Bentham's view was utilitarian and allowed the option that you could do 'bad' things, like lying, in order to achieve what you believed was a good outcome. The debates about whether politicians told the truth about Iraq's weapons of mass destruction spring to mind. Did they lie in order to achieve what they saw as a more moral outcome, the bringing down of Hussein?



## Casting your seed upon the ground?

‘Seeding the system with good ingredients’, the phrase I used in the lecture, has an intentionality about it. But does this suggest we can just cast our intentions of the moment or particular actions into the mix or do we need to act in a more concerted, sustained fashion?

There were differing views on this. Jim, for example, talked about trying to generate more work of the kind he wanted. He said that he ‘*put out*’ the idea he would like to do such work, and talked to a few people and then sat back. He felt he was seeding the system and then waiting to see what would take hold. Margaret also talked about putting something in to the system, and then being detached from it and letting it take root or not. Michelle talked about starting random conversations, holding intentions – but not too tightly – and stopping holding out for outcomes.

I felt this approach was too loose, too trusting that what emerged would be ‘good’. It seemed to suggest that the system in some sense would select for your intention or action if that was what was meant to happen.

## Is emergence necessarily ‘good’?

In a similar way, complexity theory is often used to support the idea of leaderless teams; it is assumed, in this literature, that what emerges through the reflexive interactions in a group is by nature appropriate and helpful. This idea is often constellated with the notion, in economic theory, of the invisible hand, which became central to general equilibrium theory as developed by Walras (Roncaglia 2005:322). It connects to the Aristotelian idea (Roncaglia 2005:19) that ‘good is what conforms to nature’, that human systems, if left largely to their own devices, will tend towards harmony and balance. Roncaglia brings our attention to the fact that Adam Smith, often cited in relation to the importance of market competition, did in fact believe that people have to act morally for this to be effective: to have (Roncaglia 2005:123) ‘respect for the well-being of others’ in order to achieve positive outcomes. So, in his view competition and self-interest are tempered by ‘*sympathy*’ and respect for others. Smith saw a place for regulation<sup>121</sup>.

In practice, as I said in the lecture, it seems that what emerges when a group or system is free to organise themselves may lead to a ‘good’ or ‘bad’ outcome depending on your point of view. I pointed to William Golding’s (1954) ‘*Lord of the Flies*’ – a group of boys organised themselves and Piggy was killed. Equally, the self-organising process that led to the dinosaurs dying out was not ‘good’ from the point of view of the dinosaurs. In a similar way, it could be said that Nazism emerged and it would be hard to argue that that was a ‘good thing’. In human systems, what happens depends in part on intention, and intention is a form of leadership, even if a distributed, non-hierarchical form of leadership.

This is not, of course, to promote a hierarchical response, but rather to point to the importance of surfacing and developing values and intentions in human groups. And, in addition, to allow for the possibility that there are times for direction and boundaries and intentional interventions too.

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<sup>121</sup> In fact Roncaglia is very clear that the thesis that Smith promoted perfect competition is inaccurate. She says (Roncaglia 2005:145) ‘the idea [that Smith stood for] the ‘invisible hand of the market’ is a distortion of the history of thought; the fact that it has been – and still is – so frequently repeated, especially on the part of general economic equilibrium theorists, only shows their ignorance of the texts.’

## A balance between intention and emergence

There was quite a lot of discussion about emergence and intention, particularly in Gen's group. Peter made the point that it is often necessary to have a balance between holding intentions, creating some boundaries and at the same time leaving space for connections and emergence. He made the analogy with 'As You Like It', where you need both the court (the structure, the boundaries) and the forest (the wild unregulated spaces). In other words, you need some direction, some boundaries, some intention as well as giving space for experimentation, failure, learning, adaptability, diversity, looseness. You need both to allow diversity, allow connections to be made, allow creativity to occur, allow things to emerge, whilst also promoting certain behaviours, discouraging others, setting limits and creating visions.

Peter also told the story about the deliberate influencing that went on to get buy-in to the new (at the time) monetarist economic worldview. Indeed, Alastair McIntosh (2008), in his book 'Hell and High Water' makes a similar point – that the advertising agencies are very good at promoting products and points of view through the use of so-called viral marketing. An example of viral marketing is when companies give money to children to mention their products in their blogs and on Facebook. The advertising agencies teach them how to do it subtly, and reward them every time a particular product is mentioned. This viral marketing is an example of creating strong intentions and then finding ways to reward and nudge the behaviours that fit with these intentions. It is both tight and loose, facilitated and serendipitous, operating through connections and chance encounters and yet intentional, aiming to influence. The marketers cannot know exactly what will happen, but they can act to nudge the system, ride on successes, connect ideas together and so on. This is obviously an example of how to work with complex situations and systems where the intention (to sell more fizzy drinks, for example) is, from some points of view, not a laudable one. But McIntosh's point is to suggest that the green lobby would do well learn from this – to be more intentional, act in greater concert, build on chance events, seize opportunities for influence.

Fran took a slightly different approach in an example she gave, where intention played a bigger part. In the discussions at the April meeting, she talked about two workshops she had to facilitate and the fact that in the first workshop, two people dominated it. She said *'if I wasn't careful they prevented others speaking, hooked me into arguing with them and into trying to prove I understood what they were talking about'*. She explained that she journaled about this on the way home and remembered a paper on 'ways of knowing'. Before the next workshop she gave the two dominant people a copy of the paper in order to explain that she was interested in other ways of knowing other than propositional knowing (making assertions). She thought it might occupy their minds and make them less disruptive. She went on to say to herself: *'this is an offering, let's just see what emerges'*. She then described what happened next. *'I had one exercise as an ice-breaker but in the event it turned into the entire session. They forgot I had given them the paper, I forgot I had given them the paper. Just because I allowed myself to let go, all my fears went away. I went with the way things were going.'*

What interested me about this example is that Fran framed this as a letting-go, as a faith in what might emerge. I heard it as a combination of intention and freeing-up. She *intentionally* singled out and influenced the two people who were disruptive, intentionally set off with the ice-breaker she had chosen and then worked with what emerged. I saw it as a good example of the two aspects – intention and emergence – coming together.

## Trying to influence potential tipping points as they are happening

Perhaps the most interesting example of working with both intention and emergence was given by Chris at the April workshop. She talked about a negotiation in which she has been involved. She realised that the terms they might negotiate constituted a major factor in shaping her and others' lives. She described it as a moment of path dependency<sup>122</sup>. I thought this was very interesting as she was describing the feeling of a critical moment, a potential tipping point 'in the moment' – of knowing this moment is key and critical as it is being lived. This is in contrast to most of the discussions in the groups where people were considering examples of tipping points after the fact, so this was new. Chris talked about being aware that what was being established in those negotiations might have unintended consequences; that it was important to consider what was emerging *as* it was emerging. She was considering how to shape what was emerging, how both to try to understand what already exists in the system, through '*partially-revealed glimpses*', as she called them, and to build on that and be sensitive to what was happening in the moment; to shape what comes and hold intent.

I thought this was an extremely interesting – and indeed exciting – example of working with intention and emergence 'in the moment' – through paying attention to what was happening, what was being felt, what was being revealed, what was intended.

Chris talked about thinking of emergence and intention working together; as she said '*we shape and are shaping both at once; recognising it; it does matter what I do*'.

## Summary; reflections on this theme of intention and emergence

I think that the discussion on how to act in a complex world was particularly vital and interesting and indeed useful when people grappled with this balance between intention and emergence, between planning and responding, between structure and looseness. Mechanical thinking often suggests unambiguous approaches, based on the idea that evidence is obtainable, that prediction and control is possible. Simplistic views of complexity thinking can seem to suggest that things are so complex that all you can do is to take a step, then wait and see what emerges. These discussions explored the middle ground between these two positions. It seems to me that it was and is very important that people really explore this and I would want to find ways, in teaching and facilitating discussions about complexity, to really spend time to find ways for people to engage in more depth with this issue.

How would I define 'this issue'? How both to respond to what is emerging and yet try to shape what is happening – yet knowing what we do will not inexorably lead to where we want. Take a step, see what happens, then take another step. Intend outcomes yet adapt to circumstances; try to shape and nudge and influence what happens and also seize opportunities. Accepting the world is complex is not a recipe for passivity, but for intentional, if tentative, action.<sup>123</sup>

The 'belief in the market' is very strong in our culture at present: deregulation of the financial systems, minimal government intervention, a trust that the market will select what it wants and that competition and consumer choice will provide the best controls. Brian Arthur (1994) amongst others has pointed out that the existence of positive feedback loops suggests that in free markets the big often get bigger and the powerful more powerful. And the 'big' can exert enormous influence, lobby governments, control supply chains, pay for marketing which shifts consumer behaviour in subtle

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<sup>122</sup> I might argue with the terminology; all moments are path dependent, but only some are potentially critical or potential tipping points.

<sup>123</sup> This theme – of intentionality – is explored in Buddhism too and I will return to this in Chapter Eight.

ways. If the intentions of the 'big' are to make more money, get bigger, then they are unlikely to pay undue attention to issues of equality and social justice or the longer-term issues such as climate change. This belief in the rightness of emergence is cause for concern.

On another tack, I was particularly interested in Chris's exploration of the tension between intention and emergence *in the moment*. She described how she strove to be conscious of the dynamics of a particular critical moment in a negotiation as it happened. This excited me as it suggests a real-time research methodology which fits within a complexity ontology and, as I have mentioned, this is something I would like to develop. I return to this in section 8.7.2.

## **7.6 A group review of the complexity inquiry, November 2010**

### **7.6.1 Feedback from members of the inquiry group**

In the last three sections I have reviewed the discussions the inquiry groups held around the topics of tipping point and self-organisation – focusing first on the use of these terms as description and then on their use in shaping action – and I have described my own learnings and reflections as a result of listening to the tapes of these sessions. Some of my learnings centred on *process* – how I can improve how I teach and work and inquire about these ideas with groups; some of the learning focused on *language* – how best to describe these complexity terms; and some of the learning was about deepening my own *understanding* of complexity.

I want, in section 7.7, to summarise my learnings and to look forwards. Is complexity useful? How would I now do things differently? But before I do this, I wanted to gain some feedback from some of the complexity inquiry group who have met every three or four months for nearly two years. The four people I include in this feedback process – Jim, Lycia, Fran and Paul – have been to nearly every session and each uses these ideas explicitly in his or her own work with groups and organisations. Jim, Lycia and Fran were all present at the November meeting; I corresponded later with Paul and add his comments in a later section.

### **7.6.2 Making sense of experience; a spiritual framing**

Jim, Lycia and Fran all said that complexity theory helped to make sense of, give meaning to, their experience. Jim, for example, said: *'I use complexity theory to make sense of things. The jargony words have less impact on me – e.g. tipping point. The general philosophy is what is important. It has re-branded the sacred for me'*.

Lycia said: *'It is the only thing that has ever explained my experience; I started to pull away from Christianity and complexity theory makes me feel much more connected and in tune with the world'*.

She went on to say: *'I am happy secure, maybe I am in an attractor basin; I seem to have spent a lot of time at my edge.'*

And Fran said: *'Complexity theory gives me a strategy for existing in intolerable circumstances; emergence means I can't possibly know – and it could be better than it looks. It makes me trust that what emerges will be right for Gaia. It is a spiritual belief as well as a scientific one. The work we do here refreshes me. I want to introduce these ideas to people and feel passionate about it. Complexity theory makes sense on a mental, psychological and spiritual level.'*

What was really interesting to me about these reflections is that it seems that the central reason for Lycia, Fran and Jim to continue to come to the complexity inquiry sessions is to do with their embracing complexity as an overall framing of meaning; as a worldview which has helped to make sense of and give meaning to experience. All three spoke about complexity as a replacement for an earlier Christian faith. I was taken aback by this. I had not expected that others would also make this link to spiritual meaning that I describe was the case for myself in Chapter Three. For these three, this was not a theory to pick up and put down, a theory ‘out there’ to ‘take or leave’, but rather something that was profound, central, that gave meaning to experience, gave some guidance as to how to act in the world.

So the people who had been most attracted to complexity theory and had stuck with this inquiry for two years were attracted to it as an overall framing for their lives; they were not there particularly to learn more about the details, or to apply it meticulously (as Jim said, the ‘jargony bits’ did not matter to him) but because it gave a sense of meaning, it contextualised and validated experience. This was a very interesting – and for me an unexpected – finding<sup>124</sup>.

### 7.6.3 Informing action

The other aspect to their reflections was to do with how the ideas of complexity theory informed action. I was particularly interested in how Jim evidenced how his thinking had moved on. He has expressed in the past the fact that complexity thinking supports the notion that you put an idea, an intention, out there and then let go. Fran also talks quite often about letting go of outcomes. And both Jim and Fran have several times referred to my comments about ‘putting good ingredients into the mix’.

But what was interesting in this meeting is that Jim said he was now paying more attention to planning whilst still finding that putting out ideas about possible work was, equally, still generating some opportunities. So it felt like his approach was starting more clearly to incorporate a more determined, and focused approach, to find a different balance.<sup>125</sup>

Fran described this tension. She said: *‘Behave as if you know what is right; at the same time believe nothing matters.’* This is congruent with the Buddhist notion – ‘act with compassion knowing that all is illusion’. (The congruence of complexity with Buddhism has emerged in several places and I will return to this in the next chapter).

Fran gave a good example as to where she felt complexity thinking helped her in a tricky situation. She said:

*‘I was hauled over the coals by my new boss. He was being rude about a colleague and I, quite politely, said I did not think that was a nice thing to do. He was very angry. He also lost my notes on a change management course I was going to run and then told me it was not how to do it and what I should do. I didn’t feel scared or intimidated. I felt I could do the right thing in the moment – point out his behaviour re the colleague, and let go of the outcome, not think about whether he would give me a good reference, or what would happen next.’*

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<sup>124</sup> I am not sure why I found this so surprising at the time – unexpected perhaps but in retrospect, why should my experience not be the case for others? – and it shows, once again, how deeply-held beliefs can drive our choices and interests.

<sup>125</sup> I discussed this point – the balance between intention and emergence at the end of the previous section.

So Fran's example, like the one I quoted about her in section 7.5 shows how she uses intention, then acts in the moment, then lets go of the outcome. I note that I would probably be more likely to persist, would struggle - do struggle - to let go. I would say that complexity theory would suggest you could do either or both (persist or let go) at different times. But, the theory would suggest that whatever you do, the outcomes that occur will not be predictable<sup>126</sup>. So, once again I am struck by how we all interpret theory to suit our own ways of doing things – we tweak the nuances of meaning to support our own preferences.

## Developing material and developing methodologies

Both Lycia and Fran gave specific examples of how they had used complexity thinking in their consultancy work. Lycia, for example, in two of our sessions, had asked the group to discuss a framework she was developing which contrasted a mechanical view of the world with a complexity view. She uses this framework with organisations to help them to see the limitations of a mechanical view. Fran also described how she used the idea of the balance between intention and emergence in the way she designed change programmes, giving plenty of flexibility and yet providing structure and direction.

### 7.6.4 Paul's feedback

Paul was not there at this particular session when we reflected on the whole process, but I decided to email him to ask him his reasons for attending the complexity inquiry sessions; and what he had got from the sessions.

Paul is by background a theoretical physicist, like me, and he too has spent much of his life away from physics working on social projects of various kinds, so it is particularly interesting to explore his views.

Paul uses ideas of complexity in his academic work so did not in particular attend the sessions to learn about theory *per se*. But he says he valued the opportunity '*to explore the ideas in a very open and non-judgmental environment with a wide range of people and a wide range of reasons for their interests*'. He enjoyed '*actively seeking to understand the ideas/views of those who don't share [his] current conception*'. I could see that in his contributions; he often alighted on something someone said and explored it from various angles, arguing with himself backwards and forwards. He seemed to use the dialogue to trigger an inner debate that was as important as the group debate to which he contributed in such an engaging fashion. He often seemed excited and engaged by this and wrote a lot of things down.

Although he does not resonate with others' views of complexity as a sort of spiritual home, he said he does connect it with the Buddhist notion of 'apratistha' which he told me is defined as 'to settle down where there is no settling down'. Paul says that apratistha strongly resonated with ideas of quantum mechanics and physical/chemical dynamics. As he says, '*from that perspective not only is the world in continual change but is continual change*'. He feels that complexity is '*congruent with [his] developing worldview... and extends it and provides a grounding*'.

I very much resonate with Paul's last statement and I think that what he describes is a shift I have made myself. There was a time when I saw complexity theory as 'true', or at least the best truth

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<sup>126</sup> Buddhists work with intention and say that to lose intention is to be 'blown by Karmic winds'.

available. I now see it as a useful step forwards, a way of challenging a reductionist perspective, a more beneficial and helpful picture. But I am left less strident about it, more curious to explore things experientially, more interested in how we think about what we can hardly find words to think about. How can we sit with experience and not immediately jump to modelling or containing or defining that experience in some way? So Paul's email helped me to recognise that shift in myself.

### **7.6.5 Conclusion; reviewing others' views of the complexity inquiry**

So, although many others had attended the inquiry sessions and many others had come to many of the sessions, the 'core team'<sup>127</sup> and I seemed to share a sense that complexity replaced other forms of meaning and indeed formed a sort of spiritual meaning. I found this very interesting and was surprised by it; it was very congruent with my own explorations of the meaning, for me, of complexity, described in Chapter Three – but, interestingly, I was not expecting others to be driven by this same underlying motivation. Paul's position felt less 'spiritual'; his approach perhaps reflected his background as a physicist, trying to understand the world, find frameworks which provided a perspective on the processes of interaction and change. This 'approach of the physicist' – to view things systemically and look for commonality – also struck a chord with me.

## **7.7 Conclusions; what have I learnt? Is complexity useful?**

### **7.7.1. Introduction**

This has been a long and detailed chapter. I have sought to explore some examples in detail as to how I have put across complexity ideas and the sort of discussions these catalysed. I have also reflected on these discussions, pulled out themes that struck me as I listened to the taped accounts of the discussions. So I have presented the material as a personal reflexive learning history, where I give an account of what happened and then react to it, comment on it, as I work through the account.

In this section, I want to bring together the key learnings for me from this inquiry. There are a number of threads to this learning. First, what have I learnt about the *process* of trying to engage with others on the topic of complexity? What has worked well, what has worked less well? Secondly, do I conclude complexity is *useful*? In what ways is it useful and in what ways is it less useful? Thirdly, has this inquiry changed or developed my view as to what complexity theory *is*?

These are the topics I set out to explore in section 7.2.2.

I have also reflected, as a fourth topic, on how the *process* I have followed in this chapter – a personal learning history approach – worked for me as a learning process.

### **7.7.2 What did I learn – about the process of engaging with others on the topic of complexity?**

#### **The importance of discussion and, in lecturing, less is more**

At the first inquiry session in March 2009, I asked people after the lecture to rate to what extent complexity seemed useful. And, in the afternoon, after the groups had met and discussed the topics, I asked the same question; the scores were noticeably higher. In other words, discussing and chewing over the ideas in groups made the ideas seem more relevant and useful for people.

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<sup>127</sup> Of Lycia, Jim, Fran and Paul

I was also very struck, at the April session, by Mark's reaction. He said, *'For many reasons I nearly did not come today but I am so glad I did as my head is on fire with stuff'*. I found this very interesting; listening back to the tape of his discussions in the group, it was not obvious to me that that was happening to him – that he was 'on fire' – so engaged and inspired. He sounded rather disengaged at the beginning of the day and it was marvellous to find he had found the session so stimulating; but what this showed me is that much, if not most of the learning and excitement comes from people exploring what is important to themselves – triggered, without doubt by the material presented to them and by the context – but mainly driven by their own questions and interpretations. What makes something important for someone in a group may be neither obvious nor triggered by what I, as convenor of the group, may have seen as important.

Putting this issue - the importance of discussion - together with the recognition, explored in the previous few sections, that what I meant by what I said was not always received in the way I intended, what do I conclude? I conclude that, despite my passion for driving to explain ideas and theories as thoroughly as I can, it is perhaps more helpful to present just a few ideas simply and clearly and then give much more time for people to engage with what those ideas evoked for them. So I feel, if I did this inquiry again, I would present less, present things in smaller chunks, provide clear, illustrative examples and then give more time for group discussion – followed up with plenary questions and discussions.

## **Precision**

Listening to the tapes of the discussions has also helped me to refine the way I explain certain concepts, helped me to be more precise. I had many examples where my poor choice of words caused confusion. I could hear in playing back the tapes of the lecture, how wordy I can be, how fast I can speak. The need for fewer words but greater precision is evident.

## **Preferential use of stories**

It was very striking how people interrogated the complexity ideas more through the stories I told than through the theory *per se*. Even the more theoretically-inclined in the group seemed to prefer – and were most affected by – the stories. As I discussed in section 7.4.3, this places a lot of importance on the selection of stories. Is it better to tell 'true' messy stories which do not clarify the point or to tell manufactured stories which are unambiguous? As I concluded in that section, it is probably better, in presenting ideas, to tell tidied-up stories so at least the theoretical point is clear, but then to invite interrogation of those concepts through the discussion based around 'real-life' stories. It was the way people tested the ideas using personal stories that most struck me in the conversations and discussions. I have become much more conscious of using and selecting stories in my teaching – and inviting stories in response. This is not to say that there is not a place for describing unadorned theory but this work has shown that stories make theory much more accessible and also can allow a discussion about theory through the exchange of stories about situations that people have experienced.

### **7.7.3 Is complexity useful?**

This question, 'is complexity useful?', formed the basis for the inquiry described in this chapter. What have I concluded? I feel that complexity **is** at its most useful at the level of worldview; that working with the idea of a complex, organic, emergent world in contrast to the dominant image of the 'world as machine' leads us into a more participative and tentative relationship with the world and with each other. And, in holding this attitude of tentativeness and participation, we are less likely to treat the



earth as a resource, or to assume the future can be controlled when it cannot – as these attitudes require a sense of separation and predictability. So I *do* think that, in its broadest sense, complexity theory gives a description of the world that is more congruent with ‘how the world is’ than a mechanical worldview. That is to say I think it is more the case that the world operates systemically and organically than that it operates like a machine. And I *do* think such a description – of the world as organic, emergent and so on – is *useful* in that it shapes our behaviour, if we adopt such a worldview, in a helpful way. Helpful in the sense we are less likely to try to control the uncontrollable (such as the economy); act as if we can disconnect the connected (such as acting as if the economy, social justice and the ecology are separable); less likely to assume reversibility (that we can go back to how things were if we get it wrong); less likely to imagine we can predict the future if we understand the present.

What I am less convinced about is whether the more specific concepts of complexity are so ‘useful’. People give their own meanings to terms such as ‘tipping point’, as I have shown, and it is easy to get caught up in trying to decide what it means rather than place attention into observing or acting in the world. Thinking about concepts can act as a barrier rather than as a facilitative process. And can I – or indeed anyone – explain well enough what the mathematical modelling implies about the way such processes work so they are unambiguous? And indeed, if there were three mathematical modellers present, they may all have differing views anyway as to what was key to ‘tipping’ – as my example in Annex 6.1 shows. I am reminded that complexity concepts are still metaphor, no matter how well such terms are defined and described.

So I am beginning to question whether the jargon and science-framing of complexity can get in the way of engaging with and exploring the complex world ‘out there’. Would it be better not to talk at all about concepts such as tipping points and emergence? I find this difficult to decide. Many authors in the management and popular literature wax lyrical about fractals<sup>128</sup> and edges of chaos, as I discussed in Chapter Six. So if I ignore this, and say nothing about the concepts, I do not help people to find their way through such literature. And, if I want to describe a complexity worldview, I have to include *some* comment about tipping points, for example. I cannot say nothing about the propensity for radical shifts in regime as this is such a central idea. But I notice in teaching subsequent to the first complexity inquiry day, I have chosen to say less in detail about these concepts and spend more time providing input and exercises and the space to engage with complexity more generally as worldview.

I have so far discussed complexity as *description*. The other part of the discussions that did seem to me to be ‘useful’ was when people started to engage with how you would *act* in a complex world. How would you set up organisational processes to give opportunities for synergistic connections (such as free coffee at certain times of the day)? How would you go about developing business strategy (as discussed in section 7.5.3)?

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<sup>128</sup> The term fractal comes from chaos theory and suggests that patterns at differing levels in a system have the same structure – a very questionable concept. For example, wetness is present in water but not in its constituent ingredients; life is present in humans but not in their constituent ingredients, including water. The term ‘edge of chaos’ comes from some simple modelling of complex systems done some time ago and suggests there is an ‘edge’ between order and chaos. Is this in general the case, and if it were the case, would this be a ‘good’ place to be, as is often suggested in the literature? I comment on these issues in Annex 6.2.

## **Two key themes: intention and emergence, and ‘moral behaviour’**

There were two intertwined themes in particular that I thought were particularly interesting and important, which I considered in section 7.5.3. The first centred on the balance between ‘tight and loose’, between leadership and participation, between intention and providing opportunities for emergence.

The second was the moral issue – of ‘seeding the system with good ingredients’, of whether morality is in the act or the outcome; of whether ‘bad’ can lead to ‘good’ and vice versa. Both these themes have emerged out of this work as key themes, central considerations to take forwards, as ongoing inquiries in thinking about how to engage with the world. I return to these themes in section 8.7.

So, these practical discussions, triggered by the complexity material, I found very engaging and useful in the sense that they did result in a discussion about action and design and did seem to progress mine and others’ thinking.

### **7.7.4 Has this inquiry changed my view as to what complexity theory is?**

To some extent I have already answered this question in the previous section in considering how complexity is useful. I am increasingly focused on the way complexity theory, in broad terms, provides a perspective on the nature of the complex world. Whilst my definitions of the concepts of complexity have not changed substantially, it is true to say that I think they are less important than I previously thought and yet I also feel I am more precise in the way I define them, as exemplified by my summaries of the concepts of ‘tipping point’ and ‘self-organisation’ given at the end of sections 7.3 and 7.4.

Part of this increase in precision came from listening to people in the groups really test the notions – of tipping, of self-organisation – and test them ‘to destruction’ as I described it earlier. It brought home to me that, despite my best intentions, I can present too concrete a view as to what these terms mean, and I can miss some of the subtlety and complexity that is in the world ‘out there’. Paul, for example, discussed the fact that we do not pay attention to when things do *not* tip when we would have expected them to. This can include situations where disaster is averted, for example the recent financial crisis did not lead to the collapse that was expected. And it can include situations where we try very hard to change an organisation but things conspire against us. This thought – of focusing on the issue of ‘not tipping’ had not occurred to me and I found this widening and deepening of the discussion very fruitful and interesting. I feel, in presenting such terms now, post this inquiry, I am both broader and yet more precise in what I say, and give more space to discussing the fact that ‘tips’ for example, are not in general clear-cut and unambiguous; that not all aspects of a situation may ‘tip’ and change and re-form; that there are issues of timescale and spatial scale – i.e. when and over what region do you look to decide whether there has been a change?; that some changes are gradual; that things may revert. These nuanced and detailed discussions have changed my perspective. And I notice keenly when these terms are discussed or described in simplistic terms.

I have also been particularly engaged in the various discussions as to how you act in a complex world; the balance between intentional action and working with emergence. This has led into my developing interest of how to research complex, emergent issues in a social world – particularly in the moment, as they are happening. Can you work with these ideas as a situation unfolds, be it a personal one (such as Chris’s example of shaping a negotiation) or a more global one (such as the riots taking place in the UK in August 2011)?

### **7.7.5 How has the process I have followed in working with the inquiry material contributed to my learning? Would I change the process if I did this again?**

What was particularly powerful for me as a learning process was listening back to the taped discussions which followed the morning's lecture on complexity that I gave at the first inquiry meeting in March 2009. I have not worked with tapes before in this way and it does, of course, allow for repeated listening and for hearing *all* that is said and not just selecting parts that fit with a developing thesis or idea.

I have found this approach has brought learnings and reflections to the surface for me, reflections that have not always come to me when working more analytically. Listening back to the taped discussions the groups had on the material I presented to them had the deepest impact for me. I reacted both emotionally as well as cognitively. I really felt my reactions to the discussions. This has made my learnings more heart-felt, more embodied. I can really experience some of the confusion in the taped discussions, and really *feel* the challenge to me and my thinking in some of the comments in the discussions – the challenge to my own understanding, the challenge to my ability to communicate.

I have found working with this level of detail very effective in creating shifts in my own views and methods, and it has created change in me at a sustained level. I have changed my views as to how to work with complexity ideas and what interests me to take forwards in an embodied way, not just at the level of thinking.

Equally, I think that the way I have developed learning, by engaging with the taped material, almost dialoguing with it, reflecting on it and gathering conclusions as I go, may have made this account more repetitive but does demonstrate how my conclusions grow and reinforce as I move through the material. I can see the power in developing a learning history, a rich and messy account of what happens and then reflecting on it. And I think working in this way has led to deep and embodied learning.

Another aspect of the process to consider is how themes of interest have emerged. For example, I had not anticipated that the theme of retrospective coherence would develop so strongly, as discussed in section 7.3.4, nor the focus of interest on the tension between intention and 'trusting' to what emerges discussed in section 7.5.3. So, whilst I feel it makes the categories under which I explore the themes seem in one sense ad hoc, I feel that by not having research hypotheses, I have been more able to spot what had energy, what seemed important or interesting – and therefore perhaps useful.

In what ways would I change the process of inquiry? As already discussed, I would have lectured less, presented less material. I would have structured the first day with more opportunity for questions and discussions in plenary following the group discussions. But, in relation to the process of how I have *engaged with*, learned from this material, the learning history approach I adopted – albeit a history developed and commented upon just by myself – I have found very effective. It has reinforced the view that comes both from the action research community and from complexity theory – that it is in the particularity of the detail that real understanding is to be had and where change can happen.

## ***Annex 7.1 Briefing for the day's workshop***

### **Is Complexity useful? A workshop to be held on March 13 2009, 10.00am - 4.30pm**

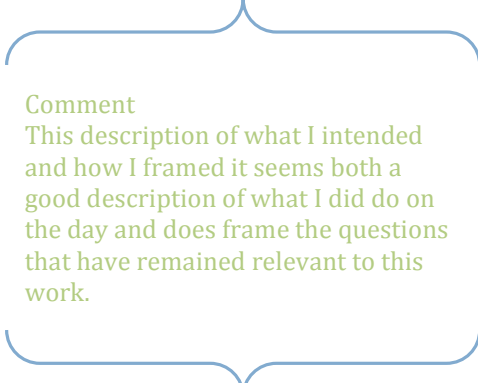
Complexity theory gives a picture of the world as systemic, emergent and with a future that – in principle – cannot be known. The theory has derived particular meanings for concepts including self-organisation, emergence, 'the tipping point' – and indeed for concepts of complexity and diversity. But are these concepts useful and practical? What meaning do they have when we consider them in relation to experience? Complexity theory provides us with a way of describing the way things are, but in what ways can we grapple with these ideas in practice? Do they help us to know how to act?

During the morning of the workshop, I will aim to dig down into the theory of complexity and show how these concepts have been derived, following the path of Ilya Prigogine and Peter Allen. This will build on earlier talks I have given on this subject that some of you may have heard. It won't assume any physics or maths background but will probably appeal to those with some interest and prior exploration of complexity. I will hope to cover, amongst other things:

\* how is complexity different from other systems theories, from statistics, from mechanics, from chaos theory?

\* how does complexity (following Prigogine and Allen) define emergence, self-organisation, 'tipping' and provide a commentary on evolution?

\* how were these ideas developed – and how do they relate to other traditions – e.g. Buddhism, gestalt theory, traditional science?



**Comment**  
This description of what I intended and how I framed it seems both a good description of what I did do on the day and does frame the questions that have remained relevant to this work.

In the afternoon, the plan is to hold an inquiry – into concepts including emergence, tipping, limits to knowledge. We will explore/discuss these in various ways – and this is part of a research project I am undertaking. The intention is to explore and draw together our own experiences and practices. I'd hope to be able to collect these by asking for some small bits of freefall writing during the afternoon, and perhaps by following up afterwards by phone/email with some of you.

I am interested in how/if/to what extent these ideas seem to have validity – for individuals, organisations and more broadly. For example the notion of 'tipping point' – signifying a radical change, a point of no return – is commonly used to describe the likely progress of climate change. But do

organisations or cultures 'tip' into new eras? Does it make sense to see personal change through this lens? What does it mean in practice? Equally self-organisation has come to mean, in many cases, shared leadership, loose structure – but does that accord with the meaning derived from complexity? And does it matter what it means? Does it inform how to act, how to facilitate change, or how to make sense of what evolves?

## ***Annex 7.2 Themes from listening to the tapes of March 13th 2009***

### **Complexity Inquiry April 30th 2009**

#### **Introduction**

On March 13<sup>th</sup>, we held an inquiry into ‘is complexity useful?’ I introduced the theory of complexity in the morning and then three inquiry groups spent the afternoon looking at the ‘usefulness’ of three slightly different but overlapping topics – tipping, self-organisation and emergence. The question was to consider how these topics added value to considerations at the level of the individual, the organisation and for more global considerations – of society, economics, climate change etc. Usefulness was defined both in terms of ‘does complexity offer a good description of how things are?’ and ‘does complexity help us to decide how to act?’

All these sessions were taped and provide a very rich consideration of these questions. There was quite a lot of overlap across the groups in terms of the nature of the discussion and also some differences in terms of topics (for example, one group had a great discussion about regulation, another talked a lot about retrospective coherence (i.e. our tendency to make a coherent Newtonian story out of a messy and multi-faceted past)).

What I have tried to do here is to summarise what stood out for me, how it moved on my thinking. I’d like to ask you if my response/my sense of the themes rings true for you as you retrospectively consider what we discussed at the time.

#### **Themes**

##### **1. Complexity as description versus complexity as informing action**

It felt that it would be useful to distinguish between:

*(a) ‘do we **recognise** the complexity view (i.e. is the world systemic, unpredictable yet not chaotic, non-linear, contextual, rich in relevant detail)); does it fit with our experience of how things are?’*

*and (b) ‘what does the complexity view suggest we should do?’ (experiment, take a portfolio approach, enhance diversity, not assume there is a right answer etc)*

##### **2. Desire for ways of informing action to be Newtonian**

We have a tendency to explore what to do in Newtonian terms (e.g. how do we shape change, can we make things tip, can we recognise when things are about to tip); i.e. it felt as if we were working within a planning framework, asking for certainty, unambiguity. There was little discussion about experimenting, trying things out to see if they worked, reviewing more often.

### **3. Capturing the complexity of the concepts**

The discussions beautifully explored the complexity of such concepts as tipping, self-organisation (for some reason no one discussed emergence) and explored the dangers of presenting these concepts in ways that may lead to a sort of reification (e.g. seeing ‘tipping’ as a well-defined, recognisable ‘thing’). So, change may be gradual, sudden, reverse (self-regulate), be exponential, consist of multiple overlapping changes; how we view things depends on timescale and hindsight, as people said.

And the discussions as to the relationship between what has gone before and ‘the straw that broke the camel’s back’ was great.

And made me think I should emphasise that a simple system is a sub-set, a special case of a complex system – so there will be examples of uni-dimensional causality in stable, simple situations.

### **4. Intervention versus ‘sowing seed’**

It occurred to me that what some people take from the complexity view is that you can offer things up, add them to the mix and then see what happens – but feel you can do no more. But I would argue that in a complex situation leadership, intention, control may not necessarily give you what you expected but it does not mean we should never do them – we may need to do them differently.

Peter R gave the example of a campaign in the late 1980s where people went out to influence people to ‘get’ monetarism; how do you do that, bearing in mind that the world is complex? Peter talked about having the court and the forest. How do we best influence with a complexity view in mind? How do we regulate with this view in mind – whilst maintaining diversity, connectedness?

### **5. Values**

Seeing the world as a complex system in a sense takes no moral position; it suggests a collective Karma – so previous collective actions lead to the present. However, that view does suggest that values matter!

### **6. The nature of theory**

What is theory? Some theories are lenses through which to look at certain sorts of problems and make sense of certain sorts of data. Complexity is better thought of as a worldview; it just tells us that, as a general rule, things are complex, have non-linear and multiple relationships, and can learn and change – but that form and some degree of order emerge from this/indeed because of this. So paradoxically, it says it is universally more true to say things are contextual, particular, subject to change into new forms with new qualities; it suggests that certainty and linear causality are temporary special cases on which we cannot rely. In some ways it is saying it is universally true that things are not universal. I’m not sure it sits well with everyone to see complexity in this way!

## Annex 7.3 Slide on tipping points

Below is the slide I used in the lecture, which came towards the end of the lecture; slide 33 of 36.

### Tipping Points

- The tipping point describes the point of no return at which new factors will take precedence over existing factors. The factors that were in balance are no longer in balance and other factors not noticed or thought unimportant will start to dominate (e.g. rats when dinosaurs died)
  - Although we focus on the **point** of tipping, in fact things have been changing way before then. These changes have wobbled the system to the edges of its self-regulated attractor basin and it is poised to change; how it changes is a function of what has happened to date and what happens at the point of no return (e.g. fall of the Berlin Wall story, end of apartheid)
  - So it is both true to say that small things can have big effects and also that creating ‘good ingredients’ in the system and acting to maintain connections, ‘slack’, diversity helps to shape the future even if there is little to show.
  - Also *short linkages* between causes and effects help (as is not the case with current financial systems)
  - At this point of no return, we may see run-away behaviour and, equally, we may see a smooth shift into something else
  - At this point of no return, there is more than one possible outcome
  - The sense of retrospective coherence means we see clear cause-and-effect links retrospectively when in actuality the situation was more multifaceted
- Comment**  
I had prior to this, in the lecture, described self-regulation and attractor basins – a mathematical description of the way in which ecologies tend to retain their overall characteristics and yet how variation can, when they are ‘at the edge’, tip them into new regimes
- Comment**  
The ‘short linkages’ comment did not get picked up in my accompanying talk
- Comment**  
This comment, on retrospective coherence caused a great deal of discussion and confusion. I had tried to position it as apart from complexity theory but people heard it as a part of the theory.



## **Annex 7.4 Transcript of that part of the lecture on tipping points**

*The tipping point describes the point of no return at which new factors will take precedence over existing factors. The factors that were in balance before are no longer in balance, and other factors not previously noticed or previously thought not to be important may start to dominate. So, nobody thought about the rats when the dinosaurs were there, but when the dinosaurs died, then something new emerged (the rats) that had previously seemed unimportant.*

*When things are stable, the dominant factors are in balance with each other; it's when things start to change that sometimes-small shifts, and up-to-that-point unimportant factors, can make a difference.*

*So, there are two possible triggers for tipping to happen; you've got the possibility of an overall environmental change going on which is changing the nature of the state space and you may also be making changes yourself which are wobbling you up to these tipping points.*

*So there are certain times when there is more potential for change and what you do matters.*

*So we have experience sometimes in life that we do lots of different things and nothing seemingly changes and then there are moments when it matters, when things can change into a new form.*

*I think about this in terms of Nelson Mandela, for example; I don't know whether you have ever visited Robyn Island off Capetown and been to see the cell where Nelson Mandela lived for twenty-something years. He was one of these guys who seemingly stuck to his values. Apparently they had to change the guards every two years because he converted them to his way of thinking. So he stayed true to his values, true to his beliefs for twenty-two years. He must have had a view, one imagines, in there, that nothing was changing, nothing was happening; that he was just still in prison, still there.*

*The prisoners had subversive talks; they went every day to mine chalk in a quarry which caused them all to have very bad problems with their eyes because it was so bright, and the only place they ever got to talk there was this ghastly cave where they went to go to the toilet and it got so revolting that the guards wouldn't go in there so they were able to talk to each other.*

*If you imagine that kind of story, it would be very easy to feel, if you were Mandela, that you were getting nowhere and there was nothing to show for what you were doing and, although there were rumblings, one imagined, in South Africa, there was nothing to show for it. But at a particular point, Mandela became very important.*

*Part of the story of the end of apartheid is that it was actually to do with the diamond trade; the end of the fall of the Berlin wall meant that diamonds were being released from Russia, which meant that South Africa didn't dominate the diamond market any more, which is when politicians realised they*

### **Comment**

*I note the 'two possible triggers' sentence is very hard to understand. I am trying to say that change can be triggered by an **external** shift in the environment, which, in effect, changes the game of what can succeed and survive OR it can be triggered by variations from **within** the organisation or ecology. Out or in are not exclusive concepts and also both could happen at once.*

*couldn't keep going with apartheid because they couldn't dominate the world market. So there were lots of issues going on.*

*But Mandela held the process and became important at that moment in time when there was a reorganising from a particular form which was apartheid into not-apartheid, and the fact that Mandela was there seems to have been very important at that point of tipping.*

*The point I'm trying to make in talking about Mandela is that we focus on the point of tipping but actually a lot of what happens with change is what we're all doing before. How do we seed the system with good ingredients, so that when we reach one of these moments where we're moving from one attractor base into another, that we've already affected the underlying structure of the system?*

*This can sound like a heroic story, this tipping point, but it's not a heroic story; it's to do with blindly keeping going, trying to do your best with no seeming evidence that you're getting anywhere at all, but that the ingredients are there, such that when things really kick off, then you've seeded the system with good ingredients.*

*[Member of audience:] So it feels like up to now you've been saying that you may have got what you think is a good direction but you've absolutely no idea what's beyond that tipping point, because you may cause a cascade which causes a war somewhere which does something that causes – you can't predict whether it's going to be good or bad?*

*You can't, but what I'm saying is that in a sense by acting in the best way you can, you are actually affecting the underlying dynamics of the whole system.*

*[Member of audience:] I suppose it's a question of whether you can know what 'best' is.*

*[Another member of audience:] Or what is a good ingredient.*

*No, I agree you can't know what is a good ingredient, but take this as an example: I think climate change is very, very likely to happen, and I could feel there is nothing I can do about it because I'm little old me and it's not going to have any effect. But, if I behave in a way that is in accordance with my values, so if I both try and reduce my carbon*

*footprint, and I try to influence people, and find ways like this complexity story which might wobble the certainty of the people who seem so certain about the way to control the world; if I wobble them, then I'm potentially changing what's in the system. So it may mean that the shape of the underlying system is different, and it may not ever come to a tipping point.*

*At a tipping point, I think all you can say, and I think it's a good point, is that we can only do our best and it might be me. Just supposing I was on a train and I was rattling on, I was having a mobile phone conversation with you on the train and actually Gordon Brown was sitting opposite me, and he finally got it, that his certainty about what he is doing with the economy, nobody can be that certain, so he finally got it, so he changed his behaviour and the history of the UK banking system got re-written. I wonder what formed Barack Obama, which made him hold certain views?*

Comment  
This is a good point which I don't really answer – the issue (a) of what is 'good' and (b) the issue that 'bad' actions can lead to 'good' outcomes and vice versa

*So, I am suggesting that the best you can do is act in accordance with your values, both in terms of living your talk and walking your talk, and that's it. But I find that a hopeful view. But you can't control what's going to happen at a tipping point. I think we spend a lot of time thinking about the tipping point and not about what's going on before.*

*[Member of audience:] So your car example [discussed earlier in the talk], if we put a lot of time into developing a really efficient car, you know the hybrid car and all that kind of stuff, the chances are that when there's a tip, people say "ooh that's there", rather than there being a space where nobody knows what to do. That would be a more practical example than Gordon Brown hearing you...! He never listens to anybody.*

*Yes, and it's the same if you think about people starting to recycle, all of a sudden everyone seemed to recycle and I feel really guilty then if there's something I don't recycle. Wiltshire doesn't recycle plastic and it's a pain and I feel guilty; am I going to put this milk carton in here because I can't be bothered to take it to the tip?*

*So, there's something about the tipping point where we don't know what's going to happen. The final event can be small, so there's the Berlin wall story. The end of the Berlin wall was because a politician was interviewed on TV; he was misquoted as saying "It is going to come down" rather than "We're thinking it might come down", but because people heard it as "It is going to come down", they went out that same day and started banging bits out of the wall and it was too late. So one part of the story is saying "Well, isn't that amazing, that small event had a big effect", and placed attention on what he did, but actually it's also about all the things that happened before that, that led to the fact that people felt able to go out and start hacking at the wall.*

*But nevertheless there are things that happen; if Mandela had died in prison, would the smooth change from apartheid to non-apartheid have been so easy? I'm sure it wasn't easy, but he helped hold the space, he was very important. So it's also true that sometimes small things do have big effects. Being there at just the right time does matter as well. It can matter. You might just be the person that somebody listens to. It might be different if you weren't there. If Margaret Thatcher hadn't had elocution lessons, the world might have been a much better place.*

## Annex 7.5 Discussions about ‘tipping point’

### Discussions about the tipping point; Gen’s group

In Gen’s group, despite the fact that they had been tasked with talking about self-organisation, there was in fact a long discussion about the use of the term ‘tipping’. The first part of the discussion focused in particular on whether this is a useful concept to denote something that happens to an individual.

They referred to a story I had told about being on a council for a charity and finally reaching a ‘last straw’ situation where I was clear I had to leave and did indeed do so. But the question was, was that really a tipping point in my own life story, or was I likely to repeat the behaviour somewhere else? Was I just ‘stuck in the same groove’, as someone commented?

Peter describes the fact that we are locked into family patterns. He said, *‘do we overcome them, do we sometimes overcome them, do others, for their own reasons, sometimes emphasise that we have changed and sometimes say the opposite. Maybe we are a **community of patterns**, some of which are dominant at certain times, some of which change but others of which merely go into abeyance?’*

I was really struck by this comment – a community of patterns. How do these interact? Do we flip between them?

Margaret told the story about someone at work not saying good morning one day and it was at that point she decided to leave her job. And someone asked her was that after a long process that had led up to that being the final straw.

Mark also made another point, in relation to the scale of tipping and the assumption of boundaries: *‘You might say that Totnes has tipped into an acceptance of climate change, but if you draw the boundary around the south west, then the south west has not. So how do you decide if something has tipped?’* And, as Margaret said, *‘how do you know it will not tip back?’* How can you be sure, in other words, if this is a wobble around a norm, or an irreversible change?

Peter raised the issue of the Buddhist concept of emptiness – the importance of seeing ‘tipping’ as a way of talking, needing to be careful of *‘misplaced concreteness’*, of being pulled into seeing tipping as a concrete existing ‘thing’. Margaret introduced the idea that some change is more gradual, more flowing and not always sudden and radical. And she suggested that there is the potential for continuous change, change that is always open to us. PR made the link between the notion of tipping and the Dao de Jing, which describes the idea of the door (for change) being sometime open and sometimes closed.

**Comment**  
This discussion illustrates the importance of really thinking through the implications of a concept, in this case tipping. This rich dialogue raises issues of gradual change, cyclical patterns, timescales.

And Mark pointed out that we can only know if something has changed retrospectively – and how do we decide over what timescale to look?

## Discussion about the tipping point; Jim's group

Jim's group were tasked with talking about tipping points and that is what they did. Sarah told the story of leaving her job within a large multi-national. She said that a whole combination of factors led her to leave: they decided to divest 40% of the business so there were voluntary severance packages on offer; her age; maybe she had been there long enough; the internet bubble, which seemed to offer some fresh possibilities; she didn't like her boss; they offered a voluntary severance package. Someone asked if there was a final straw and she felt that there was not, it was a combination of factors coming together. Sarah also mentioned that the vision she had had of her future, i.e. new work emerging from the internet bubble, never materialised and she then moved into academia.

### Comment

So Sarah's example is a good example of many diverse threads coming together synergistically

Paul raised the question as to whether you can go over a tipping point and get where you expect. He felt that for most people, looking back, you could identify significant events, but they did not generally lead to where was intended or expected.

There was then a discussion about how you define a tipping point.

Valerie said *'You know you tipped because your life has become very different. New things become possible; tipping point is defined by the change of state. You could be divorced and it might not be a tipping point. You can't be sure what made the difference, but you can identify a state change. If there is a coherent story looking back you could argue there is not a tipping point as there is no dislocation.'*

### Comment

Valerie really worked through the idea of tipping as regime shift – with different characteristics before and after

Alison said, *'In a western culture, we look for tipping points in big things. But maybe your mindset shifts when you are just walking along? We romanticise it [the notion of tipping].'*

Someone remarked on tipping points in evolution. The only way you can identify it is retrospectively. *'And when it comes to climate change, none of us will live long enough to know whether there has been a tipping point.'*

Someone pointed out that we couldn't deal with things if we were constantly tipping.

And could it not be the case that we might be tipping and tipping back again?

Paul raised the very important point that the same behaviour – i.e. nudging, small variations – can both work to keep things in the same place, make them resilient to external forces, as well as sometimes lead to change.

### Comment

So Jim's group was quite practical – how do you get the change you want or avoid the changes you don't want. Less focus on what the phrase means, more focus on facilitating transformation

Glenn asked, *'Can you help drive a tip? By understanding it, does it enable you to create conditions that would make it*


*favourable for it to happen?’* Paul mentioned the Black Swan book (Taleb 2007). He said, *‘What you want to do is expose yourselves to good black swans and minimise your exposure to bad ones. Can you come up with a strategy, keep the diversity and maximise the possibility of spotting opportunities?’* Glenn illustrated this with reference to Christensen’s (1997) book on disruptive technologies; how it is important not to shut down the business to new possibilities, to unexpected outcomes.

The conversation continued around how you can facilitate a tip. Paul said that Google allow people 20% of time to work on their own ideas. He introduced the art of the nudge (Sunstein and Thaler 2008), allowing people to have free drinks but only at certain times – and this harnessed collaboration. Once a week, he said, the whole workforce came together – managers to cleaners – for doughnuts and tea. But someone noted that such things work if they are spontaneous; *‘if they get too institutionalised they don’t seem to work. Indeed lots of things can come together to reinforce each other and stop things tipping. In the way that tipping is an accident, perhaps **not** tipping is an accident too. We don’t see all the things that happened that did **not** lead to big changes’.*


Someone said that the focus had been about trying to facilitate transformation in organisations, but the environmental ‘tip’ is something we want to avoid. There was discussion about how to facilitate transformation – using blue-sky and foresighting techniques, to try and promote thinking about possible futures and create more transparency for people about knowledge. Educating people about complexity as opposed to linear thinking would also promote new behaviours, create interest in adapting. And Valerie said *‘if we use old thinking to interpret what is happening, we miss the point’.*

## ***Annex 7.6 The slide used in the lecture to introduce self-organisation***

- Self-organisation is the process, over time, by which certain relationships strengthen and dominate whilst others weaken; it shapes and defines the patterns that emerge
- Self-organising always happens – despite top-down behaviour (e.g. resistance movement in Holland); there are always unintended consequences
- The process is synergistic, non-linear; when (dynamic) stability is reached, it is easy to imagine that small factors are unimportant, that relationships will hold
- Standardisation, too great a focus on efficiency, or actively breaking the potential for new relationships, will reduce the ability to adapt to changing circumstances
- The outcomes of self-organisation are not necessarily good (Nazi Germany, Lord of the Flies) - and it is not a recipe for no leadership or challenge (example of innovation firm)
- The concept relates both to changes of an organisation within an environment (pond, trek) and to changes to the environment itself (car market)



This comment, 'self-organising always happens', is confusing. What I mean is that in the natural and human world there is always variation and adjustment; but this does not necessarily mean new patterns emerge. What I was really trying to convey is that the term self-organisation does not exclude external inputs or leadership. It does not imply leaderless teams are a good thing!

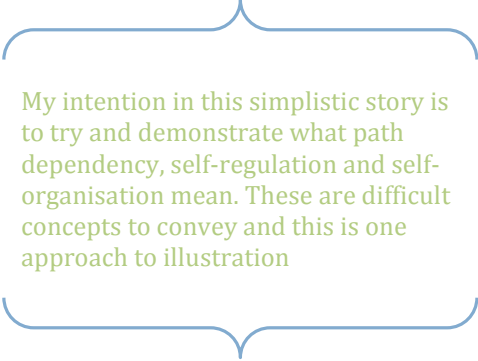


## ***Annex 7.7 An illustrative story used as part of the lecture on self-organisation***

### **Bath pond**

If one considers a complex system over time, it will exhibit **path dependency**; that is to say its behaviour over time builds on earlier behaviour; history matters. Its progress can be understood as an interplay between the ‘laws’ governing its relationships and the actual events that occur. Consider a pond; the ‘laws’ I am referring to define, typically, who eats what (or whom), the growth and ageing process of particular species, the relationship between growth and temperature or pollution.

Let’s consider a pond in darkest Bath. The frogs on this pond primarily ate water boatmen. One day Joe Frog ate several particularly juicy pregnant water boatmen just before they gave birth; on the same day, the Brownies had an outing to the pond and caught a number of water boatmen as part of their nature project. Also the warm weather had led to a water boatman virus... for a variety of reasons, there are fewer water boatmen than usual on Bath pond.



My intention in this simplistic story is to try and demonstrate what path dependency, self-regulation and self-organisation mean. These are difficult concepts to convey and this is one approach to illustration

The Brownies also managed to drop crisps into the water; both Joe’s wives ate them and unfortunately died. Joe was hungry and wifeless and he decided to hop off to find another pond. His grandfather, being old, couldn’t compete with the younger frogs for the reducing numbers of water boatmen and he died. And Joe’s children, motherless and abandoned by their father, died too. Bert, Joe’s older brother, was worried. Although there were fewer frogs on the pond now, the fit, young adults were the ones who were in the ascendant: what to do? He decided to sample mosquitoes which, due to the warm weather and the reduction in water boatmen, were plentiful. Not as nice as water boatmen, but nice enough... he heaved a sigh of relief and started to think about a nice new wife... Being an autocratic sort of chap, he also ordered all his children (and they were many) and his nephews and nieces to eat mosquitoes from now on.

This daft story demonstrates a number of issues about path dependency. It shows how the particular history of a particular pond is unique; it could not be understood in average or typical terms. The history and outcomes depend on causes and effects – but in a multi-causal manner. There is no clear, one-to-one cause and effect relationship; events have multiple causes and lead into new possibilities. Equally, the story shows how ‘laws’ change; frogs started to eat new food as a result of all the things that have happened – so a ‘new’ law has emerged.

### **Self-regulation and self-organisation**

The likelihood is that the Bath Pond will pootle along in much the same way for a long time. Over time, more young frogs will be born and also more water boatmen. Bert may persuade other frogs to change to eating mosquitoes or he may just return to water boatmen when they become more plentiful. The frog population, demographically (if you can say that about frogs) may go back to what



it was. Other small events may wobble and change things for a while, but in the end the pond life will return into a state of balance.

This process of wobbling, changing behaviour a bit, responding to small shifts and changes, is called **self-regulation**. This process is what Lovelock is referring to on a global scale when he talks of Gaia theory. The human body self-regulates like this – it can cope with variations in temperature, types and amounts of food, lack of sleep, illness – and remain in balance over quite a wide set of conditions. This is dynamic rather than static stability; the variations and lack of uniformity allow new behaviours to be tried in relation to new conditions and allow balance to be found.

However, this may not be the case: conditions – either externally or internally – may change to such an extent that in the end new relationships form, others are broken and the result is a new form of dynamic stability. So, back to Bath pond, if a variety of conditions meant that the water boatmen died out altogether, then the frogs might permanently change their diet to mosquitoes – or they may die out and be replaced by vegetarian, spotted toads, feeding on algae – which is increasing as it is not now being eaten by the water boatmen. There results a new pattern of life in the pond. This is **self-organisation**. New relational ‘laws’ now apply; the form of the new ecology could not entirely have been predicted from the previous one. If Bert Frog, for example, had been more inclined to try ants (becoming common as the creation of a concreted car park nearby had reduced their previous habitat) rather than mosquitoes, or if he had decided to hop off in search of his brother Joe, things could have been very different.

## **Annex 7.8 Transcript from the lecture defining state-space**

*State-space does not derive from complexity theory; it is a term used by engineers, scientists and mathematicians, and is an alternative way of looking at things.*

*If you think about a piece of music, you can describe that music by the notes; if I write down all the notes, I have got a full description of the piece of music, but if you use a spectrum analyser, a frequency analyser, from the days when they used to be on amplifiers, you could also capture all the information about the music in the frequency spectrum; so they're alternative descriptions of the same thing. You are not losing information by using one representation rather than using the other; so this frequency spectrum is a simple state-space.*

*Another simple example: I can describe the pendulum by saying 'well, it's here and then it goes to there and then it goes to there', or I can describe it by saying 'there's one frequency, it's actually operating just at one frequency and the frequency is this'; we've then got all the information that we need to know; a simple pendulum is represented in state-space by one point, a point attractor. An attractor is a place in state-space where systems (through noise or variations) tend towards and tend to stay.*

*And when people talk about attractor basins, they are not talking about things staying in the same place in a physical sense, they're talking about the fact that the qualities of the system tend to stay more or less the same. So to say the earth is within an attractor basin means that for a long time, it's had certain characteristics that have settled into place, and the amplitudes of these characteristics wobble around and fluctuate but the collection of characteristics and the relationships between them stay relatively the same.*

## **Annex 7.9 Transcript of discussion defining self-regulation and self-organisation**

*There is a self-regulating process which is to do with making small changes, trying things out – or, in the case of an ecological system, variations and shifts in relationships naturally occurring. After a period of time, a forest will eventually settle down in a particular form – of how many of what it has where and in what relationship. Then it will wobble around that; so it will have some resilience to changing climate or being invaded by something or having a bad year, and it's quite likely to balance and remain in the same sort of form. This process of wobbling, changing behaviour a bit, is self-regulation and it's the process that Lovelock is referring to in Gaia theory. The human body is the same. It can cope with variations in temperature, types/amounts of food, lack of sleep, illness and still function in pretty much the same way.*

*It is important to emphasise that this is an image of dynamic rather than static stability.*

*However, it is also possible that the situation – the forest or the pond or the community – does not self-regulate but self-organises. If you return to the example of Bath pond, then actually the water boatmen could have been so hammered by what happened that they never recovered; perhaps there was a virus; and the Brownies told their friends to come back and they fished all the water boatmen out and so the water boatmen died out. And then perhaps the temperature got cooler again, this was a particularly warm summer and there'd been mosquitoes, but then there ended up being no more mosquitoes because it got cooler so then the frogs died out. So there's nothing to stop, in certain circumstances, the self-regulating process breaking down and the pond tipping into a new form, where new species come to the fore, where new patterns, new habits emerge. Self-regulating and self-organising aren't two entirely different processes; what the outcome is depends on how stable the pond ecology is and how large the external interventions and changes in the environment are. But in either case, the pond will be more resilient if there is greater diversity, a greater number of options for forming connections.*

This transcript does seem to capture the essence of self-regulation and self-organisation as I read this much later. I find it hard to judge whether this is more – or less clear than the Bath pond story

This is the only place that I linked self-organisation and 'tipping' – that the tipping point is the time when one self-organising pattern gives way to another. It seems an omission not to have linked the two concepts more explicitly in the lecture

## Chapter 8 Conclusions and next steps

### *Pause for breath*

The journey of this thesis is coming to an end. I remember its beginning, its inception, in May 2007. There were eight students then and now, in Bath, there is only me, writing up, drawing things to a conclusion. We each made a collage to introduce ourselves and mine is still on the wall in my study. I look at it. In the centre is the word 'complex'. No change there, then! And surrounding it are other words and images cut from magazines – 'living', 'what is in your heart and mind is art', 'total turnaround', 'now if not sooner', 'clearly hot' and – in recognition of my life stage – 'get a good bra'! The words capture some of the sense of purpose, of the need for action, and they still ring true. And the words, as a whole, integrate a sense of Me with a sense of the whole, refer both to my personal journey and to the world at large.

I am writing this in September. It is sunny today but has the taste of autumn. This time of the year always feels significant to me – an ending, a transition. It reminds me of the end of the summer, the start of school term. And it is the time of year both my Father and my Brother died. In September 2007 I wrote the poem below. It is very sad and despairing and, whilst I am now more hopeful than the feeling tone conveyed in this poem, it still moves me.

### **The Turning of the Year**

It is the turning of the year, the turning of the year.  
I fear it is the turning of the year, of the year. I fear it is the turning of the year.

The things I hold so dear, I live in fear, it is not clear  
and I fear it is the turning of the year.

Oh dear, I miss you dear. And now you are not here;  
but the echo of your life is near, I feel it near.

And can you hear, now you are near, at this, the turning of the year?

Perhaps you stir and cannot rest? I cannot rest, I fear lest  
The end is nigh, howe'er we try.  
The cast is die.

And I fear it is the turning of the year.

I feel alone with shadows moan;  
we waste away as comes the day.  
And I fear it is the turning of the year.

No more will sunlight play and squirrels gay and we will say  
I fear it is the turning of the year.

No more we dare, no more compare.  
We bring to bear our senses bare.

It is clear it is the turning of the year of the year

It is clear it is the turning of the year.

The journey of this thesis has, for me, been an epic journey. It reminds me of a particular hill in Yorkshire, Great Whernside. I remember walking it in my twenties. It is one of those hills where the top seems nearly in reach, but the hill keeps curving so you remain for some time, it feels, at the same distance from the summit. The only change is that the mist gets thicker, you feel more tired and wonder, as you trudge along, slipping into the bog between the unhelpfully-spaced hummocks, why you set out. Then you reach the summit. The fog clears. You forget about the trials of the journey and revel in the expanded view, the sharpness of the detail, the ability to see from where you have come, to see the way the woods and fields – which felt separate and distinct on the way up – in fact interconnect, make a whole.

This thesis has gradually and increasingly become the central strand of my life. Over the last few months in particular, it feels as if Life is what I do to prepare for Thesis; that Life is just a pause, an excursion in service of increasing clarity or improved turn of phrase; that Life is a semi-colon in the sentence of Thesis.

In the next sections, I want to reflect on this whole journey and try and articulate what I have gained, what I have learnt. I also want to return to the beginning, to the sense of my role in Life, to which I hope to return, and clarify what I might do next.

This thesis has changed me, refined me, improved my scholarship, increased my precision, clarified my focus. In many ways Thesis has not given me a choice. I have kept trudging on. I hope, sincerely, you conclude the view is worthwhile.

## ***8.1 The Complexity Turn: narrative, science and utility***

### **8.1.1 What are the themes of this thesis?**

#### **Utility**

The overarching theme of this thesis has been to explore whether complexity is ‘useful’. As I discussed in Chapter One, I have deliberately used this rather vague and general concept in order not to constrain what might emerge. I summarise my conclusions to this question in section 8.2.

#### **Science**

From this theme, ‘is complexity useful?’, there have developed a number of contributory questions and themes. One group of themes has been ontological in nature. In order to consider whether complexity theory is useful, it is necessary to consider what *is* complexity theory – or complexity science, as it is sometimes called. And this begs questions as to what is theory and what is science. What is theory – and what, indeed, are metaphor, worldview, meta-narrative, paradigm, concept and hypothesis? When do you define something as science? Is complexity theory a science? These questions led on to questions as to how you ‘do’ theory and science, how you go about developing theories? I summarise these aspects of the thesis in section 8.3.

#### **Narrative**

The underlying process adopted in this thesis is one of narrative. I am interested to evaluate the methods I have used to undertake the research, which I explore in section 8.4. Have these been

effective methods? What have I learnt about the process of undertaking research for complex situations?

### 8.1.2 Where next?

The work in this thesis has sparked a number of questions and interests that I want to take further. In this chapter I want to outline these themes and outline some initial thoughts as to how to take them forwards.

The themes are:

- Worldview as change process
- Complexity theory and human systems
- A complexity social research methodology

Then, finally, I want to consider the focus and purpose of my work from hereon in. Where and for what purpose do I want to do research? What would I like to do next and for what purpose?

## 8.2 Utility: is complexity useful?

Through the process of the research described in this thesis<sup>129</sup>, I have concluded that complexity theory, when taken as a worldview, is indeed useful! It stands in contrast to the dominant mechanical worldview, and its scientific origin accords it an authority, at least with some. It allows us to assert that *science* supports the idea that the world is systemic, emergent and contingent – that *science* shows knowledge is limited, that the future cannot be known, only discovered. So its scientific authority allows a credible challenge to the dominant worldview. Why is this useful? Because the dominant mechanical worldview suggests that the economy can be controlled, that climate change can be reversible, that strategies and plans can be optimal and easily-designed, that policies can be treated independently of each other. To assume predictability when this is limited, to assume control of things that cannot easily be controlled, makes us both ineffective and dangerous. Assuming the world is like a machine fuels a lack of concern over climate change (as, if the world operated like a machine, climate change would be reversible), it legitimates top-down leadership and the futile separation of inseparable systemic issues such as economics, social justice and the environment.

As I have shown earlier, other worldviews, emanating from Buddhism and Daoism, encompass very similar worldviews. But complexity theory not only *describes* a complex world, it also is ‘useful’ in that it sheds some light on what *makes* it that way. For example, it not only describes the world as emergent, but it also gives an explanation as to what *makes* the world emergent. So it provides an explanation of ‘how’ as well as describing ‘what’. This gives us some information as to how to act in a complex world, emphasises the importance of variation and connection<sup>130</sup> and the tension between intention and emergence, directing and responding.<sup>131</sup>

But, as discussed in Chapter Six and in section 7.7.3, where complexity theory becomes less useful is when the concepts of complexity are used in too real, too concrete a fashion. First, as I have discussed in Chapter Six, complexity terms such as ‘tipping point’ are not really ‘concrete’; they are often

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<sup>129</sup> And considered in detail in section 7.7.3

<sup>130</sup> Discussed in Chapter One.

<sup>131</sup> Discussed in Chapter Seven.

ambiguous and can be interpreted differently depending on the type of mathematics used. Secondly, whether we are experiencing or have experienced a tipping point at a particular moment is open to question; it is an idea meant to convey a tendency, a possibility, not a definite ‘thing’. A focus on searching for tipping points or fractals or ‘edges of chaos’ might constrain or blinker our perception, our direct experience. So I am concerned about the usefulness of using complexity terms as if they incontrovertibly exist, as if they are real.

I do not, however, want to deny the ‘usefulness’ of mathematical modelling<sup>132</sup>. Mathematical modelling allows the investigation of problems too complex to think about, and impossible just to explore empirically; climate change is one such example where mathematical modelling has much to offer. But the recipients of the outcomes of such models need to keep in mind that the map is not the territory, that such models inevitably make simplifications, leave out what might turn out to be crucial factors. They can help us think, but they do not represent ‘the truth’.

So the work of this thesis has emphasised to me the limitations, the ‘dangers’ of complexity theory if and when the detail of the concepts it includes is adopted too literally. But nevertheless I am confirmed in the feeling that, to see the world as complex with all that that implies, is much more helpful and generative than to assume it is machine-like, predictable and controllable.

### ***8.3 Science: the ‘big’ ontological questions of the nature of science and theory***

In Chapters Three, Four and Five, I explored these big and overarching questions as to the nature of science, the nature of theory. I also wanted to explore how people ‘did’ science and developed theories, scientific or otherwise.

As I said in Chapter Two, these are big questions and grand themes with huge literatures and much scholarship. What initiated my interest was more prosaic. I wanted to understand in what way complexity theory was a science and to do that I needed to consider what science and theory were.

I was particularly struck by what happened, as I describe in Chapter Three, when I started to follow the story of why I was so attracted to complexity theory; when I explored the feelings it evoked in me as I allowed myself to ‘stand outside’ the theory, to consider it more objectively. I began to see the way we engage with theory is through what Mencius<sup>133</sup> called Xin, translated as ‘heart-mind’. We engage with ideas that matter to us emotionally, viscerally, intuitively as much as analytically or cognitively. And this engagement seems to work systemically, concurrently on all these levels, rather than sequentially and distinctly. My own experience is mirrored in the experiences I report, in Annex 4.1, of other scientists and theorists. And, although most traditional perspectives of the processes of developing theories are linear and systematic, even their authors comment that in practice people do not work in such a well-defined way. Theorising is driven by hunches, by questions that will not go away, by chance events which trigger a thought or capture the imagination.

This personal learning history of how I engaged with complexity theory caused me to question why the less concrete aspects of the world could not be included within its bounds. Just because they are hard to define and to model is no reason to exclude the human experiences – of meaning-making, imagining, feeling, intuiting and so on. And this idea caused me to question why science is generally

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<sup>132</sup> From which the complexity concepts are derived.

<sup>133</sup> Mencius was a Confucian philosopher, a contemporary of Aristotle.

regarded as the process of exploring objective rather than subjective experience and often excludes the contingent and path-dependent aspects of the world. And indeed the research in Chapter Five shows that even the most ‘scientific’ of sciences, Newton’s mechanics, is predicated on questionable axioms, is limited in its range. So what is regarded as science is a social construction, dependent on the scientific paradigm that dominates at the time.

This is not to say, of course, that there is *nothing* at the heart of definitions of science. The understanding of cosmology and the developments in technology are evidence of this. And many scientific characteristics, such as electromagnetic radiation would seem to satisfy all the conditions of positivist science. But, very recently, there has been evidence that the velocity of light may not be invariant after all, so even this sphere of science may be challenged. And, as I have discussed, with respect to evolutionary science, evolution seems to happen universally and the process of evolution remains consistent, repeatable – but the actual *path* of evolution is path-dependent, contingent on the particular details and events that occur. So science can embrace contingency. Equally, as I have argued in Chapter Six, we can explore in a scientific manner ephemeral or ethereal aspects of our experience such as dreams or pain or synchronicity so science can or could include qualities as well as quantities as Brian Goodwin (2007) has emphasised. This expanded view of what is science led me, in section 5.4, to position complexity theory as a post-modern science<sup>134</sup>.

This exploration of the nature of theorising and science has been a liberating experience for me. It has allowed me to extend my view of what complexity theory can embrace and to see science more broadly too. I would still argue that scientific processes should be systematic, subject to scrutiny and critical challenge. Such processes should be repeatable and universal in the same way that evolution is repeatable and universal – but I would suggest that scientific processes may incorporate contingency and indeed the processes themselves may evolve over time. And the focus of the scientific exploration may include the subjective as well as the concrete and objective.

This tension between process and history was indeed captured by Prigogine and Allen in their definition of complexity theory. As Allen (1997:16) explains:

‘[complexity] begins to throw light on the basic difference thought to exist between ‘science’ and ‘history’. In the former, explanation was believed to be traceable to the working of eternal, natural laws, while the latter provided explanation on the basis of ‘events’. In this perspective of self-organising systems we see that both aspects are present and that such systems are not described adequately by either laws (their internal dynamics) or events (fluctuations) but by their interplay.’

I am taking Allen’s definition one step further and suggesting that the interplay between scientific ‘laws’ and historical ‘events’ can reposition science to *include* this interplay. So, through allowing contingency into science, we place history within its bounds.

## ***8.4 Narrative: the processes adopted in undertaking this research***

### **8.4.1 Personal learning history**

I have used two key action research processes in this thesis. The first is a narrative approach, a personal learning history, as described in Chapter Two. The first example of adopting this approach is in Chapter Three, when I follow the threads of a personal inquiry as to why I have been so entranced

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<sup>134</sup> A description, as I found out later, which had already been coined by Lyotard.



with complexity for so long. Has complexity been ‘useful’ to me? I follow this inquiry over a two-year period.

The second example of a personal learning history is at the end of Chapter Five, where I followed the path of how I came to the view that complexity is a post-modern science.

My interest in following this method is that complexity theory tells us that the detailed path, the minutiae of what happens and in what order, affects the outcome. The theory suggests we run the risk of not understanding what really happened or not shedding light on why something happened *if* we gloss over the detail. So the questions were – does this method show something interesting; does it show the way in which contingency is important; does it validate the theory? And to what extent does it seem to be a helpful method to explore complex problems? So one question is about *discovery*; do the methods allow the exploration of the details that complexity theory suggests are important aspects of the problem? The other question is about personal *development* and change; do the methods create learning, change those who are involved? These two questions are intertwined as, if the personal learning history method were sufficiently unsuitable, then it would be unlikely to validate that contingency is important.

With respect to the first question, narrative as discovery, I have gained a great deal of respect for using narrative approaches to uncover and make visible the detail of situations as they unfold, without undue selection *ex ante*. For situations where detail and path dependency matter, I would even argue that narrative methods are scientific; and indeed, in those situations, *more* scientific than traditional scientific methods which lose or gloss over the detail in attempts to generalise or to combine a multiplicity of data in order to argue statistical significance. I would not, I believe, have uncovered the importance of the role of emotions in changing my understanding of complexity, for example, without studying in detail the responses I experienced in my reactions to and journey with complexity theory, discussed in Chapter Three. So narrative both exposed the detailed path of change as well as facilitating the change through exposing the detailed path.

With respect to the second question, following the details, as far as I have been able, of my own journey, has effected change in me, in my views and beliefs and in the ways I approach research and work with others.

Indeed, the learning history was not only ‘of use’ to myself. Two people read Chapter Three and gave feedback. Although their motivation had been to give feedback on the clarity of my writing, both did, in fact, dialogue with the material. It sparked ideas for them and resonated with them in various ways and so, in that sense, the narrative *did* act in the way a learning history is intended to work – to spark ideas and reflection through engagement with it.

In fact, I really feel proud of, and ‘fond of’<sup>135</sup>, the personal learning histories detailed in Chapter Three and section 5.4. I feel I gained a form of clarity I did not have before and this clarity, this reframing, feels very embodied. For example, as I discuss in Chapter Three, I feel quite strongly now about the importance of including the imaginal and intangible within the bounds of complexity science. I had felt its lack before but could not articulate that, did not really know what this sense of malaise was.

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<sup>135</sup> This is an odd term to use but it is the closest I can come to describing my feelings. I regard it rather like a piece of jewellery given me by my father, or a cherished book from my childhood.

I was also very struck by how a change in personal worldview requires a willingness to address issues of identity and that this was accompanied by facing a sense of loss. And I would not, I do not think, have gone through this reframing, nor identified what was happening, without writing about it over an extended period. So the approach, of following thoughts and feelings and actions in detail, both *created* the change in me and *evidenced* that change, as I have already commented.

It was, for example, only in hindsight that I noticed the emotional swings it encompassed. And that, now this particular journey is over (or seems over) the feelings – of a sense of something missing (at the beginning), the returning sense of depression (towards the end) – have left me<sup>136</sup>. But the conviction that our exploration of the complex world needs to encompass this ethereal realm seems both very ‘true’ and important to me; I hold that view on a deep level. And it continues to excite me and drive me. I feel excited when I think about it. I would not, I do not think, have gained that feeling if I had just read about it. Indeed, I *had* read about it – in the work of Peter Reason (2001), Brian Goodwin (2007), Teilhard de Chardin (1964); even mathematician Roger Penrose (2006) talks about a world beyond where mathematics can reach. But it had not come home to me, was not a viscerally-held belief, if I can put it that way, before I undertook this inquiry. So this action research method – a detailed, narrative, a personal learning history which fits with a complexity ontology – has, in my view, proven its worth.

Equally, in relation to my exploration of complexity as a form of post-modern science detailed in section 5.4, I have gained the same sense of excitement. I feel there is something fresh to say here about the nature of science and a fresh way to position complexity thinking. I feel freed up. And, indeed in the research leading up to that inquiry – looking at the way scientists and others have ideas, develop theories – I felt excited to be part of such a rich creativity and excited to read to what extent such creativity is quirky, imaginal, visceral. And even, one might argue, such creativity emanates from the ether itself. I often wonder how Einstein woke up one day wondering if  $E=mc^2$ . The thought that the velocity of light is invariant<sup>137</sup> is hardly obvious, could not be derived empirically, is entirely counter-intuitive.<sup>138</sup> Are art and science really very different at the creative stage? I would not necessarily disagree that science needs *testing* and validating in a systematic manner; but *creating* new concepts cannot generally be organised, does not occur systematically.

Both these inquiries have made me excited and motivated to seek to develop a new methodology that fits explicitly with a complexity ontology. As I have said in discussing this at the end of Chapter Six, I do not imagine such methods would be entirely new, and they would certainly build on narrative approaches. But what *would* be new would be the framing of the research and what methods might be used in combination.

## 8.4.2 Co-inquiry

The second key action research methodology followed, in Chapter Seven, was a form of co-inquiry into whether complexity is useful. It was cooperative in the sense that a group of people met several times over two years to discuss their views of complexity and exchange ideas. It was also very much a personal learning process for me in that I gained a great deal from listening to tapes of group discussions. I found it remarkable how much more I heard when I listened to the tapes than when I

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<sup>136</sup> I set out the steps in the process I went through in section 3.5/3.6

<sup>137</sup> Which is what this theory infers.

<sup>138</sup> The velocity of *sound* is not invariant for example, as evidenced by ambulance sirens sounding higher as they approach you and lower as they retreat.

was there listening in the room<sup>139</sup>. Listening to these taped discussions, hearing what my ‘lecture’ had triggered in others, hearing how people engaged with these ideas, critiqued the ideas and discussed with each other was a very fruitful learning process. I found myself talking back to the tape ‘I didn’t mean that’; ‘I had never thought of that angle’; ‘what an interesting question.’ Again, as with the personal learning histories, the learning I gained feels embodied. I really feel very convinced about the need, in process terms, for more dialogue when I run sessions; to give space for more questions, for dialogue between people, for testing concepts against examples.

For example, when I led four days of teaching of complexity theory at Schumacher College in January 2011<sup>140</sup>, I ensured there were plenty of opportunities for discussion and questions and was always surprised by what people raised. I remember an ongoing discussion as to what is meant by self-organisation. The fact that there was so much discussion meant that I was constantly revising my material, re-planning what we did next, thinking of new ways to engage with the ideas. It felt very fruitful and engaging both for me and, it would seem, for the participants. And I also spent much more time finding ways to engage with the issue of worldviews rather than getting too involved in the detailed concepts. In general I paid attention to framings and contexts and comparisons – considering connecting questions such as ‘how does complexity compare to other ways of thinking, to systems thinking more generally, to action research?’; or ‘how does complexity compare to evolutionary theory or Buddhist philosophy?’.

So the complexity inquiry led to changes both in *how* I teach and engage with groups as well as *what* I teach.

Although I have focused primarily on my own learning process, it is clear that others learned too. The quality of the dialogue in the discussions, as exemplified in sections 7.3.3 and 7.4.2 shows this; people build on each other’s ideas, answer each other’s questions. And, as described in section 7.6, I asked four of the people who attended almost every session of the complexity inquiry over two years what they had gained. Some had been able to use the opportunity to develop practical methods to bring complexity alive with groups. Most had found it an important confirmation of their personal worldview.

### **8.4.3 The whole thesis as a learning history**

The whole of this thesis is a form of learning history, an account of my own learning, although it has not been presented historically. The work for Chapters Three, Four, Five and Seven took place in parallel but the thinking for Chapter Six, where I clarify the differing approaches to complexity, happened much later. My approach to the work has moved between bouts of action research, then into bouts of investigating theory; then, later, there have been periods of organising and classifying material, seeing patterns, noticing key points where my views changed.

Have these processes of research and inquiry worked? Have they been good processes? How could they have been improved? I think the journey leading to this thesis has been effective for me as a learning process. I have changed my view on certain things – the nature of science, the extent of complexity science – as already discussed. I feel much clearer about what I think about complexity, about its limitations, and I feel much clearer about the differing approaches it encompasses and about where I want to put my own efforts in the future, as I will discuss later in this chapter. And this clarity

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<sup>139</sup> Although in many cases I was not in the room when discussions were taped as they happened in parallel.

<sup>140</sup> See reference to this lecture in section 3.7.1.

does not feel as though it is held just at a cognitive level, but that it is deeply held. I feel motivated, excited, sure of my ground, confident about what I want to do.

It is interesting to consider how the approach I have taken might compare with a more ‘designed’, ‘planned’ approach. I have the impression that for some people who undertake social science research, there is much more focus at the beginning, in defining the questions of interest, or hypotheses, working out a research methodology, defining the breadth of a literature review, seeing whether the questions were answered or the hypotheses confirmed at the end. I deliberately chose not to work in such a designed fashion. There were key inquiry questions at the beginning; these were ‘how do people theorise?’, ‘is complexity useful?’, and ‘why am I so interested in complexity?’ I felt exercised and motivated by these three questions which really grasped my attention at an emotional as well as at a cognitive level. And I had an interest in taking a journaling, narrative approach and in undertaking a co-inquiry. But, apart from those questions and decisions on methodology, I was unclear where the research would develop, where it would take me, or even where I wanted it to take me. It has felt that one step has led on to another step. I did not know and indeed had not expected that the inquiry group, for example, would carry on for such a long time. I had not expected to get so seized by the idea of complexity embracing the ethereal realm. The outcomes and the developing, emerging processes have been a surprise, in many cases.

The difficulty with working in such an emergent way is that it has taken a lot of work to work out, of all the things I have done, to decide which are important, and to work out how to present them. How to get a balance between telling the story intelligibly and yet not making it coherent where it is not coherent? In Chapter Seven, for example, I had an enormous amount of material. If I am too slick in how I present the material and my conclusions, I may risk post-rationalising tidy conclusions when the truth is more messy or pluralist. I also wanted to show the conclusions and patterns as they occurred to me, which means they do not always fall into neat categories. I am struck in one place by the attention that is given to the term ‘retrospective coherence’; I am struck in another place by the discussion about what is self-organisation. I am intrigued by the debate about intentions and values. Someone else listening to the same taped discussions may notice other factors, and notice them in a different order.

So this approach is not analytical – or at least not linear; it does not look for evidence within a framework established at the beginning. This means that the process of deciding what is important and how to present it is itself complex and uncertain. I had to write Chapters Three and Seven, for example, at least three times, until a structure emerged which seemed to work, was true to the research and (hopefully) clear and engaging for the reader. I have sometimes felt discouraged, wondered if I have anything to say worth saying. Do all researchers feel this or is it particularly the case if you endeavour to work in an emergent way? Is there something to consider about this in thinking about future complexity-informed research methodologies? Is it more ‘hard-going’ than more prescribed research? Where there is less structure, there is less security and this can create an emotional response which needs acknowledging.

There is the same difficulty in looking to the literature. I have roamed over the literature for complexity, the philosophy of science, action research, narrative approaches, qualitative social research, history of philosophy, spirituality, and psychology. I have dug up personal accounts of theorists and writers and scientists discussing their processes. My choices of what to read have been affected by books people suggested I read, by following my nose in seeking out literature, influenced by which books and papers were already sitting on my shelves. I imagine if I had pre-defined the

focus of a literature review, this would have been a more systematic process. So I gain in breadth and lose in depth. If this were a degree in philosophy it may be viewed as lacking in rigour, I imagine. But I want to present the ideas that I found that connected with the empirical research I was doing. I want to be true to the process I followed and show what *did* trigger a thought, or excite me. So the result is necessarily eclectic and incomplete.

So, as a piece of action research focused primarily on the inner arc of attention, focused on how ideas change and develop, I *do* feel this research has worked for me. It has been worth doing. I have changed my views, I have developed clarity and precision, I have a clear view as to how I want to work on what I want to do next. And I feel emotionally committed to those ideas. I feel energised for action. I would not want to change the way I have worked if I started again; it has been a fruitful journey. Whether it is of interest to others and whether my arguments and examples and justifications are convincing will be reviewed by the reader.

## **8.5 Where next?**

I listed, in section 8.1.2, the themes and interests that were constellated by this research and which I want to take further. I will now consider these.

First, in section 8.6, I consider the importance of continuing to develop ways to surface, explore and critique worldviews. I have come to the conclusion, through the work of this thesis, that one of the key contributions complexity theory can make is to provide a worldview that stands in contrast to the mechanical worldview. And, therefore, how to engage people in exploring their worldviews and beliefs, in being able to stand apart from them and critically review alternatives, becomes an important contribution I can make.

Then, in section 8.7, I consider a number of themes centred on applying complexity theory to human systems. In section 8.7.2 I discuss the implications of the fact that humans have intentions and values and make deliberate choices and actions – unlike inert physical and chemical systems on which the initial work of complexity theory was focused. In section 8.7.3, I start to take further an exploration of the subjective and numinous world and the idea of the non-duality. In section 8.7.4 I draw together some of the threads that have emerged during the course of the thesis in terms of the relationship with Buddhism and complexity thinking.

Finally, in section 8.8, I explore how I can contribute to the development of a social research methodology explicitly framed within a complexity ontology. This is an important step for me in moving into the domain of social research and social policy. The desire both to develop such a methodology, and to focus on social research and social policy, has emerged during the course of this thesis.

These explorations are beginnings, are incomplete. I am wanting to show how the work of this thesis has catalysed further work, sparked further inquiry. These final sections need to be approached from that perspective – as tentative next steps, not fully-worked-through or fully-researched ideas.

## 8.6 *Worldview as change methodology*

### 8.6.1 Why does worldview matter?

One of the issues that the work in this thesis has emphasised for me is that, just to accept that the world is complex – that is to say, systemic, path-dependent, contingent on local conditions, emergent and with a future ‘under perpetual construction’ – changes us. It fundamentally causes us to rethink how we approach the world, how we make sense of what happens. A shift to this worldview, a release from ‘Galileo’s spell’ as Kauffman (2008) described it, can have enormous impact. Often, in change methodologies, people want answers to specific problems. So they want a mathematical model of a specific problem, to shed light on how to manage an aspect of the economy or shed light on what strategy to adopt. Or they want to know how to make an organisation creative yet efficient. Or they want to know how to develop successful strategies or how to select the best organisation structure. But just to *accept* that the world is complex rather than predictable and controllable is to change our approach to *everything* – to change, to management, to policy development, to evaluation, to leadership – and to living.

So, finding ways to get people to reflect on their worldview, to move towards an acceptance of the world as complex, is in itself a critical component of change. This is something Brian Goodwin emphasised later in his life. And the importance of worldview to shape behaviour, meaning-making and action is also emphasised by Reason. Reason (1998) stated that ‘the challenge of changing our worldview is central to our times.’

### 8.6.2 The paucity of interest in the ontology of complexity

It is striking how little emphasis is given in the complexity literature as to the ontological stance of complexity, to complexity as worldview. Complexity modellers, as I have discussed, implicitly assume that a realist model can mirror aspects of the empirical world sufficiently well to make such models useful. But they do not seem to spend much time in thinking about the world ‘out there’ in ontological terms. Complexity economic geographers Martin and Sunley (2007) and complexity economist Hodgson (2002), all make the point that relatively little work exists which addresses the ontological question as to the qualities of a complex world. As Martin and Sunley (2007:581) say, ‘in complexity theory epistemology has dominated over ontology.’ Martin and Sunley (2007:582) mention Potts (2000) as an exception to this. They say:

‘for Potts, the ontology of methodological individualism, social atomism and equilibrium of traditional economics is replaced in complexity economics by an ontology of connectivity.’

Geoffrey Hodgson (2002) takes a similar emphasis, in this instance focusing on evolution rather than primarily on complexity<sup>141</sup>, exemplified by his paper ‘Darwinism in economics: from analogy to ontology’. In this paper he considers Darwinism as an ontological framing, as an ‘universal meta-theory’ (2002:278). He says (2002:260):

‘Darwinism involves a general theory of the evolution of all open, complex systems [and] a basic philosophical commitment to detailed, cumulative causal explanations’.

But these authors are in the minority in complexity circles in placing a primary focus on ontology.

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<sup>141</sup> Although, as the quotes below show, he links the two

### 8.6.3 The complexity worldview

So, having expounded on the importance of complexity as a worldview, how would I now, following the work of this thesis, define a complexity ontology, a complexity worldview? I have discussed this at various points in this thesis and will summarise here.

A complexity world is a world that is **systemic**, connected; and more than systemic, **synergistic**. That is to say, our understanding cannot be reduced to looking at the independent effects of constituent factors.

A complex world is **holistic**, where what is there – the concrete measurable factors and also the subjective, qualitative or totally beyond knowing – will contribute to the whole.

A complex world is **contingent, path-dependent**; the detail and the order in which things happen matter.

A complex world is **patterned**, shows self-organised structure – and yet those patterns are temporary and can change, whereby factors previously unimportant can come to the fore.

And a complex world is **unknowable** (or not entirely knowable) and **evolutionary**, where the future can **emerge** and may have new features and relationships which could not have been predicted.

A complex world is non-linear; sometimes situations become locked-in, hard to change; at other times the ‘door is open’ and change can be rapid and radical.

### 8.6.4 How to engage people with an exploration of worldview

More can be done to elevate the importance of exploring a complexity worldview as an important aspect of complexity thinking. My work in teaching and lecturing on complexity increasingly focuses on this issue – exploring worldview; comparing a complexity worldview with pre-modern worldviews, with a Newtonian view, with evolution. How do I discuss this? I present the changes in worldview historically and explore why we tend, as humans, to prefer some perspectives to others. I help people to explore how our psychological preferences – for certainty or for fluidity – prejudice how we look at the world. The work of Chapters Three and Four has emphasised how my approach must be cognisant of the way beliefs and worldviews are held emotionally as much as cognitively, how loosening their grip is often accompanied by a sense of loss or is fiercely resisted. Some of the methods I use are discussed in section 4.5.2.

### 8.6.5 Why is worldview so important?

Let me give an example of the importance of worldview. If policy makers were to act as if the world were complex, they would perhaps actively plan for the inevitable, unintended consequences of policy. They would naturally work to look at policy in a systemic fashion rather than separate economic from social from environmental. Economics would self-evidently be political, in that it would be obvious that the context and history of the situation would impact policy. Whether or not to tackle climate change early or late would not be in question, as the potential for runaway change would be accepted; and policy-makers would not expect climate change models to predict the future precisely. Such points as these were made to me by one of the chief scientific advisers to the government, Brian Collins, who accepts a complexity worldview and despairs at the difficulties in getting policy-makers to think in these ways. He said (Collins 2010):

‘One of the difficult aspects of encouraging policy-makers to think in this complex way is that it requires them to change their worldview. Civil servants and politicians have, perhaps, not been challenged to think differently about ‘the way things are’ since their days in education, when, perhaps, they embraced free market economics or regarded good scientific practice to be about identifying clear, separable cause-and-effect chains in service of clear, unambiguous outcomes. Dealing with the complexities and interdependencies of policies, goals and implementation processes requires a huge shift in thinking.’

I believe complexity theory gives weight to a worldview which stands against the still-dominant modernist Newtonian mechanical view. And, as I have argued in Chapter One, a view of the world as systemic, something in which we participate rather than control, something that indeed cannot be controlled or predicted or ever entirely understood, is a more helpful, generative view than to assume we can predict and control, and indeed *reverse* the future when we cannot.

So, my intention, in the future, is to continue to concentrate, in lecturing and running workshops on complexity, on emphasising the importance of exploring and surfacing the worldviews and deep-seated beliefs we hold. And to continue to refine ways for groups to explore their worldviews, to understand the nature of differing worldviews and to reflect on the implications of making the questionable assumptions, as many management and economic processes do – of predictability, stability or control.

## ***8.7 Complexity theory and natural and human systems***

### **8.7.1 The implications of complexity thinking for natural and human systems**

In section 7.4.2, I describe how Arthur raised the question as to the implications of applying complexity theory, a theory developed initially in consideration of chemical systems, to human systems. What are the implications, for engaging with complexity, of meaning-making, holding intentions, planning, acting in concert – all things that molecules in chemicals cannot do? To state the obvious, human beings, unlike chemical molecules, can analyse, reflect on, imagine, create intentions towards and consciously affect the social systems and natural systems of which they are a part.

Prigogine, in developing complexity theory, was well aware of this issue. For example (2001:225) he said:

‘There is a large difference between the behaviour of inert systems and the behaviour in living systems [where the past contributes to the formation of the future]. In living systems, even very simple ones, the behaviour at a given time is partly determined by the memory and partly by the anticipation of the future. In this sense the future contributes to the present.’

So he is describing how thinking – in this case, anticipating the future – becomes part of the complexity of the situation. He also discussed the issue of choice, of free will and acknowledged that, when a bifurcation or tipping point is reached, making a choice will, if not securing the outcome, at least have an influence. He said (Prigogine 2001:223):

‘In case of animals of sufficient sophistication, conscious free will may select the branch [at a bifurcation] that is taken’.



Depending on whether we are going along with the prevailing flow, intentional behaviour may amplify a change, or might do the opposite. Thinking of humans not as cogs in a wheel but as elements which act and decide adds new factors, new dimensions to the problem, but I would argue in line with Hodgson (2002), that it does not change the *nature* of the self-organising process *per se*. Self-organisation occurs due to some of the elements of the situation synergistically, reflexively reinforcing. If some of those elements are intentions and aspirations, they can still, in principle, be considered in the same way – as factors which interpenetrate and interact with other factors, either antagonistically or synergistically.

Having made this comment, this is a very important point not to be glossed over and is a good reminder that abstracting theories from science into the human realm needs careful consideration and recognition that the map is not the territory and can never capture all that is there. This requires ongoing exploration.

### 8.7.2 Intention and emergence

The implications of the comments in the section above raises the question as to the balance between *intention* (planning, strategising and acting in accordance with such plans) and responding or *adapting* to what is there, what happens, what emerges. I have come to feel, through the work of this thesis, that this middle-ground perspective is the central feature of applying complexity ideas to real-life situations. Whether we are talking about strategy or change or economics or living our own personal lives, this tension between intending and directing on the one hand, and responding or adapting on the other, is the crux of the matter.

In contrast to this statement, as I have discussed in some detail in section 7.5.3, complexity thinking is sometimes thought to support the latter position: that we should primarily trust in what emerges. But, as I argue in section 7.5.3, complexity thinking does not suggest there is anything necessarily ‘good or positive’ about self-organising processes, about what emerges; complexity theory does not support this idea of ‘natural law’.<sup>142</sup>

This point is not well represented in the literature on complexity. Peter Allen<sup>143</sup> is fully in agreement with this need for a judicious balance between strategic action and skilful response. And Graham Room (2011) in his book ‘Complexity, Institutions and Public Policy: Agile Decision-making in a Turbulent World’ explicitly makes the point that complexity theory legitimates a role for regulation. And I, too, have published on this topic (Boulton 2010).<sup>144</sup>

One interesting analogy in relation to this tension between intention and adaptation is the relationship between artificial and natural selection – artificial selection or husbandry being intentional and natural selection (in this case) being nature’s response – to husbandry and any other environmental factors. Hodgson (2002) and Room (2011(a)) both develop this analogy.

These are complex topics to discuss. For example, holding values (about how we treat others, about equality and social justice, about the importance of the long-term future of the planet) are forms of intention. They shape our actions. Yet our actions may not achieve what we intended. I have explored

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<sup>142</sup> Roncaglia (2005:19) says natural law takes the Aristotelian position that ‘good is what conforms to nature’.

<sup>143</sup> Private conversations

<sup>144</sup> And indeed at a recent (September 2011) conference on evolutionary economics I was struck at the extent to which most speakers emphasised the need for some sort of regulation, for ‘contained evolution’ as one speaker described it.

this issue of values in section 7.5.3. There is a vast literature to research – about values, how they are socially embedded, how they link with policy. For example, Deneulin (2011) says:

‘humans are not free agents who decide and act on the basis of their own reasoning. They are profoundly social and embedded into layers of complex social relationships. Humans actions are never disconnected from the wider networks of social relations and institutions in which people are historically situated.’

Deneulin captures the path-dependent and contexted and systemic quality of the emergence of values and the relationship between individual values and action shaped by these contexts. She goes on to discuss the dynamics of value formation and its influence on policy. She builds on the work of Amartya Sen (1987) and Giddens (1984). But such ideas do not form a large part of the complexity literature; the importance of values has not been well explored in relation to a complexity framing. This is an area I would like to develop further.

These ideas are only the start. For complexity theory to be useful in considerations of leadership, policy development and regulation, a deeper consideration of these issues would be fruitful and is something I would wish to take forwards. For example, if we need regulation then how is that achieved and by whom? What is the role of social movements in regulation, not just the traditional institutions of government or government-established bodies such as the World Bank or United Nations? How can regulation not become fixed, how can it remain alive and responsive? How do we consider issues of scale? How can we set parameters and regulate, whatever ‘regulate’ means, global business and global finance? How can we represent the needs of the poor and represent the importance of the earth and of the long-term view? And yet how can we give appropriate autonomy to local communities? Schumacher (1973) himself did not, it seems, suggest ‘small is beautiful’<sup>145</sup> but emphasised that (1973:50) ‘for every activity there is a certain appropriate scale’. How can we counter the effects of advertising which promote unending economic growth and consumerism and their role in creating ‘happiness’? These are all big, impossibly big, questions and yet they require a response. Can a discourse informed by a complexity worldview help in taking such questions forward?

### **8.7.3 Extending the definition of ‘human systems’: the mind-body connection, synchronicity, the numinous**

Another of the emerging themes of this thesis has been the recognition that more emphasis can usefully be placed, in complexity thinking, on the non-rational aspects of humans and their relationship with the world.

In section 3.7.4, I started to review the ways other authors write about these subjective factors, these numinous qualities, how they considered our perceptions relate to our experience of ‘reality’. And how even the notion of duality – that a person is separate from his or her surroundings, or that mind is separate from body – is open to question.

I quoted Reason (1998:4) who wrote:

‘Mind and the given cosmos are engaged in a co-creative dance, so that what emerges as reality is the fruit of an interaction of the given cosmos and the way mind engages with it.’

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<sup>145</sup> The title for his book was, it seems, chosen by his publisher.

As I say at the end of Chapter Three, 'I end this chapter with a sense of the start of a new process of inquiry which would take me deeper into this numinous realm – of synchronicity, of the oneness of mind and matter.'

I would like to explore this topic in more detail, building on the work of this thesis. I'd like to engage more with the work of mystics such as Teilhard de Chardin (1959) and Jung (1963), but also engage at greater depth with those who have already worked with such ideas to bring them more into the mainstream: people such as Reason (2001), Simpson (2010), Goodwin (200), and Heron (1998). Reason (2001:8), for example, says that:

'We live in a participatory world... Subject and object are interdependent. Thus participation is fundamental to the nature of our being, is an *ontological given*.'

I would like to understand more completely, at a deeper level, what this means, what this implies.

This is a vast undertaking and it has exercised some great minds. Even some mainstream physicists and mathematicians have become intrigued by the interplay between science, mathematics and the relationship with mind. Mathematician Roger Penrose (2006), for example, in an article in *New Scientist* entitled 'What is Reality?' posits that mathematical forms exist in a Platonic realm and that these can be perceived by the human mind. He ends by saying:

'My viewpoint allows for three different kinds of reality: the physical, the mental and the Platonic-mathematical, with something (as yet) profoundly mysterious in the relations between the three.'

Prigogine himself became interested in these themes. There is, for example, a video of Prigogine in conversation with mystic Maharishi Mahesh (well known to The Beatles) recorded in 1975. Prigogine and Penrose both contributed to a book, 'Mind, Matter and Mystery' (2001).

So, this is a rich and complex field to explore.

I am not viewing this inquiry merely as of philosophical interest. These issues – of the impact of dreams and the role of the imagination – have clearly affected my personal development and development of ideas and beliefs. Equally, in undertaking social research, for example, we cannot exclude the impact of religious and cultural beliefs, or the shadow in what transpires, of earlier massacres or ethnic tensions or hunger or the impact in decision-making, of the ways reality or causality are understood.

#### **8.7.4 Complexity and Buddhism**

Building on the topic of the previous section, I am, in particular, keen to consider further the congruence between complexity and Buddhism, on which I have commented several times in this thesis. In Chapter One, I suggest that the overarching worldview held within Buddhism is almost identical to that implied by complexity theory. Then in section 3.5.4, I make the link between the complexity concept of self-organisation and the Buddhist concept of emptiness. In section 3.5.5, I discuss the idea of cumulative causation, the idea of an emerging, path-dependent future, an idea which is held within both Buddhism and complexity. In section 7.6.3, I comment on the importance of values in self-organising processes and how this focus on values and 'right action' is emphasised within Buddhist philosophy.

This is a very interesting topic – how the pre-scientific thinking of 2500 years ago reached the same conclusions as we are reaching now about the complex and emerging world. Buddhist philosophy has been of interest to me for several years, although I would certainly not class myself as scholarly in this field. I have started to explore these ideas further, as demonstrated in Annex 8.1. I think the congruence between complexity and Buddhist philosophy<sup>146</sup> is fascinating. And the Buddhist theories of mind and of non-duality, which I only touch on in the annex, connect with the themes of the previous section.

## ***8.8 A complexity social research methodology – an ongoing consideration***

### **8.8.1 Introduction**

Finally, in indicating the ways in which this thesis has sparked further inquiries, a key interest that has emerged from the work in this thesis, as discussed in sections 3.7.3, 4.5.3 and 6.5.3, focuses on the development and articulation of a social research methodology that sits within a complexity ontology. I feel that there is further potential for constellating a set of research methodologies that would explicitly investigate complex systemic emergent contingent problems.

This idea of a focus on non-modelling methodologies, for exploring complex problems has emerged as an important issue for me. I discuss, in Chapter Two, how the ‘action research’ research paradigm is congruent with a complexity worldview. And I am, through the course of this thesis, exploring the way learning histories and narratives capture the particular paths of developing ideas and reframing perspectives. And I have become increasingly certain that such methods are central; can capture the contingent and path-dependent detail that is central to showing what really shapes the future.

And as well as methods of gathering information, there are other steps to consider in developing a research methodology. For example how hypotheses are both formed and tested, how disparate sorts of qualitative and quantitative data are brought together. I imagine that the a complexity-framed social research methodology would be abductive in style, constructing theories, at least in part, from ‘social actors’ language, meaning and accounts’ (Blaikie 2007:89) as discussed in section 4.3.2. I discuss the difficulties of developing hypotheses; the need, in finding patterns in the data, to find ways of developing critical subjectivity amongst a wide enough group of stakeholders, in section 4.5.3.

But there is more to say. It is interesting to ask what would be the features of a complexity research methodology which would have to be addressed. I list these features in the next section.

I am currently unclear as to the extent to which there is useful work to be done in this field. There is a vast literature of qualitative research methods. Yet complexity social scientist David Byrne, for example, intends to address this in a forthcoming book. He says ‘We will review how complexity theory can inform empirical research beginning with a consideration of how we can move beyond the quantitative and qualitative divide.’ Equally Blaikie (2007) in ‘Approaches to Social Enquiry’ includes a postscript, ‘The Complexity Turn’<sup>147</sup>. He emphasises that chaos theory and complexity

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<sup>146</sup> This statement in itself is a gross simplification in that there are many Buddhist philosophies and a vast literature both of original documents and their interpretation.

<sup>147</sup> And this has clearly inspired the title of this thesis!

theory are very different<sup>148</sup>, and that complexity can be seen as fitting somewhere between a critical-realist and a post-modern ontology. He advocates the use of research techniques based on dialogue and comments that different methods will be needed for different systemic levels. Blaikie's remarks would suggest there *is* a contribution to be made and indeed his remarks resonate with the conclusions I have drawn in this thesis.

### **8.8.2 Features of a complexity-framed social research methodology**

It is important that I summarise the features that a complexity-framed social research methodology would have to deal with. Such a methodology would recognise the ontological features of a complex world – systemic, emergent, and path-dependent and would need methods to explore such a world – pluralistic, narrative, embracing macro and micro, wide and narrow. In this section I will consider the differing aspects of a complex worldview and consider what these imply for research methodologies.

#### ***Systemic: non-linear and synergistic***

As discussed earlier, a complexity worldview emphasises inter-relationships and synergies, in opposition to the notions of reductionism and of the associated assumption of linear cause-and-effect chains. That is to say, a complexity worldview would suggest that a research methodology that is based on dividing or reducing the issue or focus of interest into discrete parts is likely to miss the factors which exist due to reflexive synergies between parts. So neither the parts of the problem nor the steps in the exploration of the problem can be treated as separate or sequential. Inductive and deductive reasoning would be too limiting for a complex world. Equally, the separation between observer and observed, researcher and researched is also overlapping and blurred in that what (or who) is there will affect the situation.

#### ***Emergent: becoming not being***

In addition, a complexity worldview emphasises the dynamic nature of the world, emphasises a world of becoming rather than being. So a research methodology would not be based on the notion that relationships and patterns and structures will last forever (or even for the duration of the research), nor that, if we uncover current patterns and mechanisms, they will necessarily shed light on the *future* development of the situation. And a complexity worldview emphasises the importance of context and history and of the particularity of events and sequences of events. So it needs a methodology which can handle shifting relationships and emerging qualities as well as explore context and history and broader environmental factors which can affect what happens. Change, according to a complexity perspective, can be driven by changing environmental factors or shifting internal factors, or both.

Complexity theory brings to our attention the tension between stability and change. What happens is affected by what we do and what we intend and yet is also conditioned by the prevailing patterns of relationships and norms, by the current terrain of attractor basins in state-space, to use the technical language. So, sometimes the dominant process is of lock-in; that patterns of social norms are so strongly held that they are very hard to shift. At other times, the focus is on understanding the dynamics of radical social change which, rather like the riots occurring in the UK recently or the so-called Arab Spring, are not anticipated, seem to come from nowhere.

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<sup>148</sup> A point with which I am in full agreement, in the company of Cilliers (1998), Stacey (2001), Gregersen (2003), Allen (Allen and Boulton 2011) and others.

To use another language, sometimes what emerges is strongly shaped by existent patterns; sometimes what emerges (if near a tipping point) can lead to a radically different landscape. Prigogine captured this tension in suggesting that change is to be understood as a co-evolution between existing patterns and structures together with the impact of chance, choice and action. So it is a dance between locked-in patterns (which are contingent on the past) being penetrated (or not) by today's choices and actions, today's contingent behaviour. Sometimes today's actions radically shift, invade<sup>149</sup> existent patterns, sometimes they do not.

So the interesting research question is whether there *are* in fact signs of the potential for social unrest and change, which if constellated by some trigger event (such as a fatal shooting by the police) can take off in a fast and furious way. How could a research method spot the growing shoots of such potential change? Can they be spotted and we just do not notice them because we are not paying attention in the right direction, or is there indeed nothing to show? If the conditions for change are right (or ripe), can *any* event set them in train?

And can a research methodology keep two hypotheses open – that the past might prevail and policy or any other intervention may have little effect (we are deep within an attractor basin)<sup>150</sup>; or we may be 'on the edge' (of an attractor basin) and poised to shift; perhaps the precise details of what creates the shift may not be very relevant.

### ***Including the subjective not just the objective***

Furthermore, as discussed in my expansion of a complexity worldview developed in Chapter Three, to take a complexity perspective would be to consider that all aspects of the situation – not just the 'real' objective features – might be relevant. So a research method must be sensitive to emotions and values and intuitions – of both those being researched and those researching – and indeed recognise that the researcher of live situations inevitably disturbs the situation and cannot ever be objectively separate. So the process, in terms of Jung's typology, needs to include all aspects; needs to include sensing and intuitive and thinking and feeling, to use his terms. None can be prejudiced over another. And Heron's description of propositional knowing, described in section 4.3.3, as recognising participatory, interconnecting dynamic events and expecting emergence of new factors, is consistent with the complexity view.

### ***Connecting macro with micro***

Complex problems are affected by the macroscopic context as well as the local situation. So to research, for example, how villages in Ethiopia develop and why some are more successful and prosperous than others, requires an understanding of the history of the region, the current political framework and the climate. But, in order to understand how these contextual factors played out in local situations it requires attention to the detailed trajectories, the detailed stories, the particular details which may include how particular chiefs or government officials affected things or how combinations of factors came together at particular moments in time and shaped what happened next.

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<sup>149</sup> Peter Allen uses this word 'invade' to describe the way new actions can disrupt old patterns.

<sup>150</sup> Attractor basin terminology provides an alternative (state-space) description of resilience versus tipping. State-space is described in Annex 7.8.

### 8.8.3 What kinds of methods would be relevant?

I am not expecting, in considering the idea of a complexity methodology, to imagine that its features are particularly ‘new’. What it is likely to entail is a pluralist approach building on existing research methodologies, where their selection and combination is justified explicitly in relation to a complexity ontology.

I imagine, in general this will require a connection of history, context, detailed and time-sequenced local stories, together with the recognition of chance events and sudden shifts in the environmental, and will include qualitative and quantitative data and analysis.

I also imagine that there will be situations requiring retrospective or relatively independent research and other times when the work is action research – in real time, dealing with change as it unfolds, both noticing and reacting to what is emerging and equally acting to shape it. Also, as I mentioned in section 7.5.3, I was very struck by the story Chris told of working with, shaping and researching, *as it is happening*, what might emerge. I would like to explore this further; how to be cognisant of, as it happens, the interplay of the past, of people’s personal attitudes and intentions and of the context, and see how this can be nudged as it is happening – both responding to what is happening and trying to shape it too.

Then there is the issue of methods of hypothesising and theory-making and theory-testing. As my work in Chapter Four shows, theorising is a quirky, imaginal, unfettered sort of process. Sometimes it is driven by information or data, sometimes theoretical propositions just arrive. But, if we are to develop a complexity research methodology, how can we develop quality in theory testing? How can we substantiate any patterns we think we see in the data and how can we test any theories such patterns suggest? This is a common problem in qualitative research and it is interesting to ask if there is a particular take on this for complex emergent problems. This will need further consideration.

The complexity researcher should, I suggest, expect to handle a range of hypotheses, look for a range of types of evidence, use intuitions, look for rational and less rational explanations of what is happening, not be surprised if things changed over time or if even supposedly similar situations were surprisingly different.

### 8.8.4 Some examples

In Annex 8.2, I provide two examples of undertaking research with explicit reference to a complexity ontology: one based on some of my own work, researching a change programme in a hospice; the other focuses on the work of Bevan, Dom et al (2011) in tracing the impact of the ‘war against poverty’ in Ethiopia. Bevan’s work exposes the complexities of working with disparate and complex sets of data. How do you set about finding patterns, making and testing hypotheses? These are questions for further exploration.

## 8.9 End note

I look back again to the beginning, to the Hay Literature Festival<sup>151</sup> and the economist’s analogy of the train. I started with a political motivation and I want to pick it up again. What am I going to do next?

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<sup>151</sup> Discussed at the beginning of Chapter One

I've just returned from a walk and I was thinking that my passion for complexity theory is unabated. I attended a workshop last week for academics interested in Engaged Buddhism. I gave a talk about complexity and I was as excited and passionate in talking about it as I have ever been. I want to continue to write about it; I want to continue to teach about it, to run workshops, to give talks. I see this as playing my part in giving an empowering, participative and holistic framing as to how to engage with the world. I love doing it. Recently I have spoken at a conference on Emergence aimed at the artist community in Wales; I've taught social science students. I'm about to teach complexity economics. I'm going to contribute to a course on science and spirituality. The speaking and engaging makes me feel alive, connected, articulate, worthwhile.

But I have a yearning for something else too. I want to explore, in a different way than I have in the past, the outer arc of inquiry<sup>152</sup>. I want to get more involved in real projects at the coal face, where the issues of climate change and sustainability and social justice are not abstract considerations. I want to 'be there', to be involved in things that matter, to be in the thick of it. I imagine myself spending time in a village in Africa or Asia, doing fieldwork, making a contribution.

And I want to connect such fieldwork with 'big' explorations of policy, of reflecting on the unanswerable questions as to how do you shift locked-in views on consumerism, how can you 'govern' global business, how can you change the discourse on the centrality of economic growth?

What can I contribute? An ability to move between detailed engagement, reflection and theory-making; an ability to articulate complex issues; an ability to speak out, be courageous; an ability to work systemically, to connect the economic with the environmental with the social and the macro with the micro; a tendency to connect literatures and ideas and wander across academic boundaries. I imagine any fieldwork would be useful in itself, and would also inform the questions I have raised about methodologies for researching and transforming a complex world. Perhaps my business background might be relevant too, in the sense that commerce is not always included in social research and yet 'Big Business' and 'Banks' and Advertising probably have more power in the world than governments or global institutions, or even public pressure.

This thesis has sharpened my understanding of the usefulness of complexity thinking. It has made more explicit both the 'what' and the 'how' of engaging others with the idea of a complex world. It has whetted my appetite for engaging more fully in social research in complex situations. Now I would like to get more directly involved in taking action.

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<sup>152</sup> Marshall (2001)



## ***Annex 8.1 Complexity and Buddhism***

### **A8.1.1 Introduction**

I have made the link between Buddhism and complexity many times in this thesis and I would like to bring together the threads in this section. I am keenly aware how brief and superficial this commentary is: there are many schools of Buddhism and a vast literature. My intention, in this section is just to touch on the similarities and differences between complexity and Buddhism and pave the way for a future, deeper exploration.

This is not a new idea. Joanna Macy (1991), for example, wrote her PhD on ‘The Dharma of Natural Systems’ and David Loy (2003) explores the similarities between Buddhist philosophy and post-modernism.

Buddhist philosophy emphasises:

- that all is connected
- that what emerges arises from what has happened before and from what is being chosen (dependent co-arising)
- that what we are, both individually and collectively, is ‘empty’ – that is to say ephemeral, context-dependent and evolving
- that our inner world drives the outer world as much as the outer drives the inner
- that suffering is caused by the illusion of permanence.

In the following sections, I will first explore the congruence between a complexity worldview and a Buddhist worldview. I will then go on to explore what is implied for taking action, for ‘being useful’ in a complex world.

### **A8.1.2 Common worldview**

There are many ways in which Buddhism and complexity share a worldview and I will explore these themes in this section.

#### ***Co-dependent arising and self-organisation***

The Western pre-Socratic tradition (as exemplified by Heraclitus)<sup>153</sup> has in common with Daoism and Buddhism a focus on flow, on **becoming**. This flow is not chaotic, however, but has form and pattern (like the particular form of flow in a particular bend in a river) and yet the pattern is never quite the same even when it persists and may at some point change into another pattern. Buddhists capture this sense of form which is not fixed through the notion of emptiness, as I have already mentioned in several places. As Loy (2003:5) describes ‘anatta’ or ‘no-self’:

‘For Buddhism there are no self-existing things, since everything, including you and me, interpenetrates (interpermeates) everything else, arising and passing away according to causes and conditions.’

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<sup>153</sup> He of the river you do not step in twice.

Loy's quote above captures this quality of **emptiness** and it is of course, very resonant with definitions of self-organisation. The Dalai Lama, speaking at a conference in April 2008, could have been writing about complexity thinking when he said the following:

'There is no self-defining discrete reality to cause or effect. Forms or feelings are devoid of inherent existence; it is only on the basis of aggregation of subtle elements that forms exist; form can only be understood in relational terms to their constitutive elements.'

This quote describes the term 'dependent co-arising'. As Macy says (1991:18), 'Its vision of interdependence, presenting reality as a dynamic interaction of mutually conditioned events posits no prime cause or unconditioned absolute to which occurrences can be traced in linear fashion.'

### ***Non-duality***

There is also, inherent within the concept of emptiness, an emphasis in Buddhism on the *interconnectedness* of everything; indeed it is more than that; more than an interconnection of objects, more like a field theory, an inter-permeation, as Loy describes it.

Both Buddhism and field theories capture the 'both-and' nature of existence. Things are both 'thing-like' and 'field-like' and which quality is more figural depends on the situation. So, in field theories<sup>154</sup>, it is both the case that everything reaches everywhere, merges into everything else, and also the case that parts of the field coalesce in space and time. There are objects, concentrations, but they have fuzzy boundaries, can shift and wobble or shift and disperse; more like whirlpools in the river than objects; but also, in some circumstances, the merging, omni-present nature of everything in everything is more figural. Sometimes, to use an analogy of the sea, you are aware of the totality of the vista in front of you; at other times, it is the patterns in distinct waves that draw your attention.

This 'field theoretic' emphasis in Buddhism connects to the theme of non-duality. There is not really a separation between mind and body, between subject and object, between concrete and ephemeral. Realist approaches to complexity do, still, conceive of the world as made up of 'things' interconnected by forces but Buddhism reaches into the area I have been exploring in Chapter Three and again at the end of Chapter Six – that such clear separations into discrete objects misses this interpenetrative quality, ignores the ephemeral, the imaginal and concentrates on the concrete.

Some of the systems theorists have considered these issues, such as von Bertalanffy (1969) and Laszlo (1996). Macy (1991:149) quotes von Bertalanffy:

'matter and mind, body and consciousness are not ultimate realities. Rather they are conceptualisations to bring order into experience, [having] no rigid metaphysical boundaries.'

Macy says: 'the relation between mind, which we subjectively experience and the world outside it, which we perceive,' forms a key aspect of Buddhism.

This non-duality between mind and matter also chimes with von Franz and Jung's interest in alchemy and in the concept of synchronicity, which I discussed in Chapter Three. Von Franz was keen to explain (von Franz 1980) that the central tenet of the alchemists is that the collective inner world,

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<sup>154</sup> Such as quantum physics.

which Jung called the ‘collective unconscious’, is at one with the external world of matter. Both inter-penetrate and share a reflexive relationship.

### ***Path dependency and karma***

Buddhism also embraces the idea of path dependency in the notion of ‘karma’. Loy (2003:7) defines karma as the process whereby ‘we construct ourselves by what we choose to do’. Skilton (1994:31) describes it thus: that ‘all intentional actions have consequences’. The focus in Buddhism, as exemplified by Loy’s quote can be primarily on the individual – how you create your own future, with no initial or final cause, your past actions make you how you are and shape what you do next. But, in fact, Buddhism does embrace a systemic view, so that karma can be considered collective. What happens to me is shaped by my own choices but is also affected by my family history, the actions of my community and culture. Veblen (1898), writing about the connection between economics and evolution, coins the phrase ‘cumulative causation’ and this captures, I feel, this notion of how we collectively shape the future.

### ***Facing loss***

Buddhism advises us that suffering is caused not by what we do not have, but by how we resist the truth of our own situation. We must face loss and from that comes acceptance and less attachment to ‘having’ – be it having ‘things’ or having immortality or having forgiveness or having security. By trying to cling to a sense of permanence, both of the inner and the outer life, we create suffering. The implication is that to accept and face this loss will lead us away from addiction and denial. This idea is very much in tune with many psychological theories, which work on the basis that freedom from addictions of many kinds lies in facing the feelings of loss they mask.

Loy develops this theme in understanding why people cling to what he calls the ‘sacred canopy’ of religion. He says (2003:13):

‘One can never recover the unselfconscious groundedness that, for better or worse, has been lost. Both individually and collectively, the freedom to determine one’s own path is shadowed by an anxiety-producing loss of security due to the disappearance of one’s transcendental foundation – a sacred canopy...that answers our deepest questions about the structure and meaning of the universe, and where we fit into that....Globalisation means that today we all participate in the... loss of ground and crisis of meaning, whether or not we understand what is happening.’

His argument is that we need to face up to this loss, feel this loss, in order to give up on fixing it with religion, drugs, material goods, climate change denial, denial of social injustice and so on.

It is also interesting to point out that the clinging to the certainty of traditional science is another form of sacred canopy. Complexity thinking denies this scientific sacred canopy in the way that Buddhism denies the sense of being cared for by a God who has a plan.

### A8.1.3 'Usefulness'; Call to action

#### ***Intention, right action***

Buddhism is very clear that the morality is in the act not the outcome and is in tune with a Kantian view of morality, as summarised in the phrase 'right action'. There is also a focus on 'right intention'. Without, right intention, a Buddhist told me, we can be 'blown by karmic winds'.

Buddhism has a clear axiology, a clear ethical code. This is a key difference with complexity theory which has none. Complexity theory, in embracing the idea of 'cumulative causation' does however suggest that what is done influences what happens next. So, there is an implication, as I have discussed in the last chapter, that 'good' is more likely to lead to 'good', and 'bad' is more likely to lead to 'bad'<sup>155</sup>; we have choice over what we put into the system. Complexity, as a science, has a commentary to offer on ethical behaviour but does not take an ethical stance *per se*.

#### ***Is Buddhism 'useful' as a social theory?***

As well as remarking on the ontological congruence between Buddhism and complexity, it is interesting to ask the same question of Buddhism as I have asked of complexity. In what ways is it useful? In particular is it useful to the social world and to informing us how to act in relation to the natural world? This links with Engaged Buddhism<sup>156</sup>. Joanna Macy, for example, has this to say on her website ([www.joannamacy.net](http://www.joannamacy.net) 2009):

'I have been deeply inspired by the Buddha's teaching of dependent co-arising. It fills me with a sense of connection and mutual responsibility with all beings. Helping me understand the non-hierarchical and self-organizing nature of life, it is the philosophic grounding of all my work. Now we see that everything we do impinges on all beings. The way you are with your child is a political act, and the products you buy and your efforts to recycle are part of it too. So is meditation-just trying to stay aware is a task of tremendous importance. We are trying to be present to ourselves and each other in a way that can save our planet. Saving life on this planet includes developing a strong, caring connection with future generations; for, in the Dharma of co-arising, we are here to sustain one another over great distances of space and time....we don't have to invent or construct our connections. They already exist. We already and indissolubly belong to each other, for this is the nature of life.'

So, as I have argued with complexity, she is arguing that the very ontology of Buddhism, the sense of connection over time and space, emphasises that our actions have far-reaching consequences and thus are (or should be) imbued with responsibility.

David Loy, also an Engaged Buddhist, is also keen to explore how Buddhist principles influence social policy and social practice. He first makes the point that Buddhism, in emphasising the connection between the inner and the outer, tells us that we cannot be effective for good in the world if we are not conscious of and in the process of working on our own nature; so inner practice becomes a social and political act. As Loy says (2003:35):

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<sup>155</sup> Although this is obviously contentious; a 'bad' act (such as exterminating all bankers) might lead to 'good' for others!

<sup>156</sup> A movement within Buddhism aimed at a focus on social practice and reform.

‘for those of us who see the necessity of radical change, the first implication of Buddhist social praxis is the obvious need to work on ourselves as well as the social system. If we have not begun to transform our own greed, ill will and delusion, our efforts to address their institutionalised forms are likely to be useless or worse.... Recent history provides us with many examples of leaders, often well-intentioned, who eventually reproduced the evils they fought against. In the end, one gang of thugs has been replaced by another.’

He goes on to say (Loy 2003:17) that ‘the Buddhist emphasis on non-duality between ourselves and the world encourages identification with others: hence *com*-passion, suffering with, because we are not separate from them.’ So the Buddhist ontological perspective reminds us we cannot behave as if we are separate from the earth and from others.

Loy is also keen to emphasise, as I discussed in the last section, that Buddhism, in bringing us face to face with the ‘loss of a sacred canopy’ as he has called it, places responsibility on us to tackle problems, to face up to what is really happening, to take action.

He also emphasises – coming back to this Kantian argument of morality in the act – the non-violent aspect of Buddhism, that peace is the way<sup>157</sup> not just the goal.

### ***Do we need both Buddhism and complexity?***

So, if Buddhism and complexity have very similar ontologies, and Buddhism greatly precedes complexity, does the complexity thinking have anything to offer? To start with, each will appeal to different audiences. With some situations, arguing from a scientific perspective has weight; for other situations, arguing from the point of view of an ancient, ethical philosophy based on practice will hold sway. And for others, the fact they are so similar in many respects will be what tips the balance and has impact. And Buddhism draws out the social and ethical implications of living in a complex, interdependent world that is largely lacking in the complexity literature.

### **A8.1.4 Conclusion**

Buddhism, together with the science of complexity, emphasises emptiness, impermanence and shows that the future evolves rather than is designed or unfolds according to a pre-ordained plan. What does this mean for our social and political ventures? Buddhism, like complexity science, suggests that we should set out on such ventures with more humility; we cannot know with any certainty what will be the result of our actions or policies or theories or plans. We have to act, see what happens and refine our actions, both individually and collectively.

Buddhism, like complexity theory, also tells us that what emerges is a complex and contextual result of interconnected factors and choices, building on the past. So (as I have said in many places in this thesis) it suggests we must pay attention to what ingredients we put into the mix, what values we hold, what intentions we weave, what actions we take. We cannot just make the future what we want as if the past has never happened. And we cannot take solace in the idea that the end justifies the means, as we can never be certain that the intended end will be reached.

John Gray (2009), Emeritus Professor of European Thought at the London School of Economics, suggests that our tenacious hold on traditional science means we think that we can create the future

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<sup>157</sup> As emphasised by Vietnamese Buddhist teacher Thich Nhat Hanh (1991).

we want. He suggests it means we tend to ignore history, and to imagine a 'breathless continuation of the present'.

As he says, this utopian view, as he calls it, creates a number of difficulties; it makes it difficult to learn from the past; it makes it difficult to consider that new approaches and new politics are either possible or necessary. If we are doing the best, making 'progress', it is easy to ignore or deny any evidence to the contrary, to imagine that 'all will be well'. Diamond's (2005) treatise on 'Collapse' shows how often societies that collapsed failed to take seriously the signs of their imminent demise.

It was Mark Twain who said 'history does not repeat itself, but it does often rhyme': a reminder that we ignore the lessons of history, and the way the past shapes the future, at our peril.

### ***Summary of relationship between Buddhist thinking, complexity and social policy***

The beliefs implicit with Buddhism, in embracing interconnectivity, the impermanence of who we are as individuals and the impermanence of the structures of the world in which we are a part, speak to the way in which we should engage politically in the world.

Embracing a Buddhist worldview would imply that we should:

- Spend time working on ourselves as individuals through meditation and stillness as well as through study and practice; learn about life through experience rather than accept any particular cosmology or science and, most importantly, face the loss of a transcendental 'sacred canopy'.
- Accept that the past shapes the future and yet the future can be affected through what we collectively choose to value, how we collectively choose to act.
- Accept that we cannot, however, know for certain what will be the outcome of any particular path or policy so that we must approach policy and political action with more humility; be more prepared to modify the course in the light of outcomes, be more prepared to act with humility and learn through action.
- Accept the reality of the interconnectedness of all things; seek to develop joined-up policies which bring together the differing and often-contradictory goals of ecological, economic and social perspectives.

It is exciting that this Buddhist perspective dating from pre-modern times, is so in tune with the 'new' science of complexity, and with ideas from post-modernism and action research and pragmatism. Perhaps it provides a philosophy that will encourage a different sort of political behaviour, which is less certain, less confident of outcomes, more engaging and holistic?

## ***Annex 8.2 Complex social research – two examples***

### **A8.2.1 Example 1; researching a change programme in a hospice**

I was involved a few years ago in researching the progress of a project being undertaken by a community engagement charity<sup>158</sup>. The aim of the project was to help a hospice in East London connect better with the Muslim community. The hospice had Christian roots and most of its staff and the users of the hospice were Christian, but the local population had a large Muslim community of Somali and Bengali origin. The aim of the research was to inform the development of a new approach to project evaluation. The hope was to find a way of evaluating projects which could deal with the qualitative and subjective; and would not require decisions to be made at the beginning as to what success would look like and how it would be measured.

I, and a colleague, undertook the research through interviews – with staff of the hospice and the charity and with members of the local community; through attending key events such as an open day at the hospice; and through reading reports and attending project meetings.

I want to give just one example of how we worked with the idea of emergence and tried to explore what was aiding or inhibiting change. This particular example was about ‘jugs in the toilets’, an issue that gained significant and symbolic importance. I will tell the story of the jugs.

There had been a lunch for local Muslim people to come and see how the hospice worked. The event went well; Halal food was provided. The feedback on the day was very complimentary; the hospice was declared clean; but there was comment that there were no jugs provided in the toilets, for ritual washing.

The director in charge of the project asked the housekeeper to buy some jugs. Instead of finding out where local Muslim people bought such jugs, she went to Lakeland Plastics and bought some measuring jugs; Lakeland Plastics could be seen as symbolising the white middle-class preoccupation with fancy kitchen utensils – and hardly culturally sensitive to say the least. The director was furious and then the housekeeper retorted that she was not happy anyway about these jugs in toilets. What were they used for; was it clean?

Every time we spoke to anyone about this project, this story was told, with embellishments and with the next steps in the story presented as a saga. Each new event was told with lots of energy and emotion.

This issue of the jugs seemed very symbolic. It gathered energy and meaning around it over and above any sort of rational explanation. It signified cultural difference, willingness to embrace diversity and to respect others’ beliefs – and it raised the issue as to who was ‘clean’.<sup>159</sup> The Muslim people I interviewed commented they were surprised how clean the hospice was; and the housekeeper and cleaning staff were concerned about the cleanliness too – what were these jugs used for? So who was clean and who was not?

Clearly, if we had engaged with this research in a very logical manner, with well-defined hypotheses and clear methods of gauging success and measuring outcomes, it would have been very easy to miss

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<sup>158</sup> And I should perhaps mention that, at the time, I was Chair of this charity.

<sup>159</sup> This theme of clean is resonant with Mary Douglas’s (1966) ‘Purity and Danger’.

this important issue. The issue of the jugs could not have been predicted and it constellated an important turning point in the project which, if handled well, would aid success and if handled badly could erect barriers that would be hard to overcome – both in the attitudes of hospice staff and in the attitudes of the local communities. In fact, it *did* get in the way for some time; and in fact, part of our role as researchers of the project was to point this out to the project team.

This story caused me to think about how research methodologies can legitimate and facilitate the spotting and valuing of such symbolic moments, which could easily be missed in the conventional evaluation of projects. And, if we are looking for such symbolic issues as part of our research, how can we make a judgement that something is indeed important and symbolic, like the jugs – and, of course, who is ‘we’? And how can we spot such issues *as* they happen, not just retrospectively?<sup>160</sup>

### **A8.2.2 Example 2; Tracing the war against poverty in rural Ethiopia since 2003 using a complexity social science perspective<sup>161</sup>**

I was introduced to Pip Bevan and Catharine Dom by colleagues at Bath. They have been undertaking a long-term research programme in Ethiopia, to investigate how and why certain communities fare better than others and how government policy and practice creates an impact. Bevan sent me the paper, the title of which heads this section. In this paper, she frames the research methodology as situated within complexity social science and discusses the ontological and epistemological consequences of this. It is a delight to read – so clear, so well-written and (thrilling for me) so resonant with my own perspectives on complexity and my own aspirations re methodology. Bevan (2010:3) quotes Byrne (2005) who emphasises that ‘knowledge must be contextual’, and says that complexity theory confronts ‘the subjective relativism of post-modernism with an assertion that explanation is possible, but only explanation that is local in time and space’.<sup>162</sup>

She (2010:4) describes a complex realist perspective where ‘social reality is conceived in relational, dynamic and processual terms. It is organised in different inter-penetrating kinds of complex open social systems with structure with variable durability – empires, societies, communities, towns, businesses, households etc.... a viable system occupies a temporal space where the past is allowed to play itself out in interaction with the present.’

She goes on to say that complex realists are interested in trajectories and that ‘social change can be brought about by changes in the system’s context, by internal perturbations or a mix of both’.

Bevan is taking a slightly more realist position than I do in adopting Byrne’s position on explanations, quoted above, that ‘explanation is possible but only explanation that is local in time and space’. Are explanations always possible, even local ones? And, paradoxically, from the opposing standpoint, perhaps some learning from local situations does have wider applicability and can ‘explain’ other situations. So it may be the case both that some situations cannot be explained and also that some aspects of ‘explanation’ do have wider applicability.

Bevan (2010) and Bevan and Dom (2011) then go on to give an overview of their methodology. They have chosen to focus at the level of the village communities as they feel this is the level at which

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<sup>160</sup> Chris, as described in section 7.5.2, tells of a situation where she was working reflexively with a critical encounter, both trying to shape what happened and be alert to what was happening.

<sup>161</sup> Title of draft paper by Pip Bevan (2010).

<sup>162</sup> This is very reminiscent of my discussion of post-modern science in Chapter Six.



development happens and where a difference can be made – but they recognise that these communities are constituted by ‘interacting economic, political, social, cultural and human sub-systems’. So they pay attention to these wider (economic, political, cultural) – and narrower (household) – aspects. Their research has taken place over several years. They take into account the history as part of the context and the ‘modernist paradigm’ adopted by the government. They develop so-called ‘thick descriptions’ of the villages, looking at the impact of village elders, of government representatives, of remoteness of the village, of the regional history. They collect stories. They work in parallel with more than one interpretation of the community as a system – as a system adapting to its environment, for example, as well as its being a community in relationship with other communities. They not only look at the communities as systems but recognise that development interventions also act systemically, in concert, are not self-contained.

This is a very brief snapshot of this work. I would like to speak with them further about the way they handled such a wide range of data, the way they reached conclusions, the way they dealt with the requirements and expectations of the government, which wants to know whether initiatives have been successful and how to design new initiatives. But I think it is marvellous that they tackle such a project within a complexity framing. Bevan (2010:32) concludes by saying:

‘The demand for evidence- and research-based policy and practice which may affect what happens to the ‘war on poverty’ in the next decade is often construed as a demand for (more) sectorally-confined quantitative indicators and statistical analyses founded on linear assumptions and focused on the short-term fate of individuals or households. The complexity-informed Ethiopian case study offers another kind of evidence base suggesting that real results unfold over weeks, months and years and that better real results might be achieved more efficiently if conclusions derived from longer-term knowledge-rich perspectives were used in the design and implementation of both donor and government interventions.’

This sums up, for me, the point! If we take a complexity perspective we might look for different things in different ways over different timescales in different combinations – and learn more about what is happening and how to help on issues of inequality, poverty and climate change.

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## **Appendix**

*The slide presentation on complexity theory given at the start of the complexity inquiry described in Chapter Seven.*

## Appendix. Slides used for teaching as discussed in Chapter 7

The Science of Complexity

Is it useful for human systems? – an inquiry

Jean Boulton  
March 13 2009  
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[www.embracingcomplexity.co.uk](http://www.embracingcomplexity.co.uk)

Objectives

- To explain the science of complexity thinking in some detail
- To define certain key complexity concepts, following the work of Prigogine and Allen
- To inquire as to the usefulness of these concepts for individuals, organisations and society; how well do they describe what happens; how useful are they in deciding how to act

Agenda

- 10.00 – 10.30 Introduction and framing of the research inquiry; establishing inquiry groups; capturing ideas and thoughts; next steps
- 10.30-12.30 Lecture on complexity science
- 12.30-1.00 First inquiry group session – general introduction and discussion
- 1.00-2.00 *Lunch*
- 2.00-2.15 Short plenary session
- 2.15-3.45 Group inquiry
- 3.45-4.30 Plenary – review and feedback from groups

Inquiry question

Complexity theory arose within the physical sciences and its ideas have developed mainly via mathematical modelling.

It provides a view of the world as relational, diverse and emergent – in contrast to the mechanical worldview.

In addition, it introduces certain concepts including self-organisation, tipping points, and emergence. ...

**Do these concepts stack up in the human world?  
Are they useful? Do they help us decide how to act?**

Complexity and action research

- Complexity and action research share a view of the essential nature of the world (ie the world is participative, evolutionary, emergent, diverse, the 'minute particulars'/micro-practice matter ...)
- The investigative methods of complexity tends to use mathematical modelling; this is limited and contentious when applied to human systems
- Action research offers ways to explore the nature of things in a direct, detailed way, immediate way and places emphasis on value, generativity, purpose

Inquiry process

- Small groups facilitated by Gen, Jim, Michelle.
- Each group to take different (but overlapping) concepts – self organisation, tipping, emergence
- Discuss in what ways the particular concept:
  - Seems to fit/not fit our experience
  - Seems useful/not useful
  - Helps us to frame/take action
- Do this at three levels
  - Individual
  - Organisational (could be family, group or work organisation)
  - Macro-level (nation, society, market, city)
- After each discussion, capture your thoughts in 3 minutes of freefall writing or a drawing or a physical posture

## Appendix. Slides used for teaching as discussed in Chapter 7

### Additional process

- What is going on here in the room? Are we tipping, self organising, are new ideas and structures emerging?
- We'll ask you to reflect and maybe make quick notes at various points as to how you **feel**
  - do you feel ... sceptical, interested, resistant, connected, excited, .....
  - have any new ideas emerged for you? What?
  - to whom do you feel connected here in the room?

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### Next steps

- Collect in notes, drawings, writing etc, including taped material
  - Please either put your name on your stuff or make a mark (the same on each one), so we can identify the stream of ideas; and please add the time to the documents
  - Please say if you do not want to be captured on audio tape
- Analyse the material....(somehow or other...)
- Second inquiry on April 30<sup>th</sup> , 10.00-1.30 to discuss the material, further ideas in relation to the inquiry question ie 'is complexity thinking useful?' Facilitators will be there and a few others – are you interested in coming?
- Write up and circulate to you all... by July

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### The antecedents to complexity theory

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### The antecedents to complexity thinking - flow, emergent patterning, form - but not fixed

*Upon those that step into the same rivers different and different waters flow...They scatter and ...gather...come together...and flow away...approach and depart*  
Heraclitus

*These rivers flow....they arise from the sea and flow into the sea....these rivers, while they are in the sea, do not know 'I am this river' or 'I am that river'.*  
Chandogya Upanishads

*'there is no self-defining discrete reality to cause or effect. Forms or feelings are devoid of inherent existence: it is only on the basis of aggregation of subtle elements that forms exist; form can only be understood in relational terms to their constitutive elements.'*  
Dalai Lama explaining Milarepa Buddhist text

*Integrity is this sense of becoming whole in one's relations with other things is a co-creative process in which one shapes and is shaped by one's environing circumstances...*  
Ames and Hall – commentary on Dao de Jing

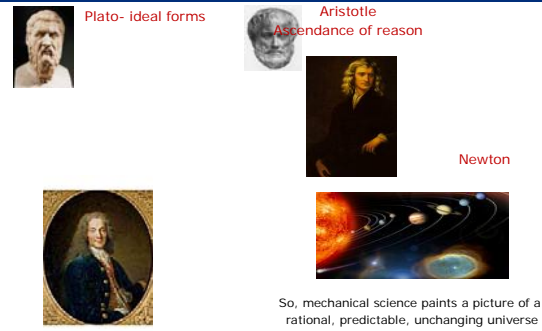
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### Has your life gone to plan?



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### How and why did Newton's physics become THE worldview?



Plato- ideal forms

Aristotle  
Ascendancy of reason

Newton

Voltaire and the French Enlightenment  
(Elements of the philosophy of Newton 1736)

So, mechanical science paints a picture of a rational, predictable, unchanging universe

14/01/2009 strategy in a complex world Page 12

## Appendix. Slides used for teaching as discussed in Chapter 7

### Newton and Leibniz – 17<sup>th</sup> century



*'There exists absolute space and time – a time zero and a centre of the universe; God set off the clockwork universe'*





*'that makes no sense; why would God choose a particular moment to start it off, rather than an hour later. The contingent relationships (ie the detailed structure of the universe) are chosen by God because they are the best possible options. Newton has no way of explaining the form of the universe'*

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### Traditional physical science

- Traditional science had two stories
  - **Newtonian**, mechanical science, applicable to closed, linear, mechanical systems
  - Equilibrium thermodynamics, **entropy**, which tells us that in the end everything dies and turns to dust





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### The antecedents to complexity science

**Darwin 1859**  
variation followed by selection

Why, if physics, in the form of the second law of thermodynamics, proposes that matter and form degrade into structureless dust, does life 'mount the incline that matter descends' (Bergson 1907)

indeterminism

holism

emergentism

Gestalt

archetypes

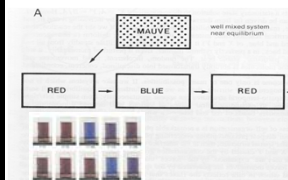
Prigogine gave an answer to Bergson's question in 1947. He pointed out that for open systems, entropy can decrease and order emerge

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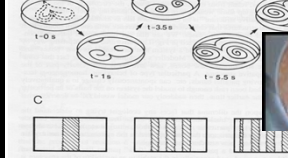
### The Brusselator Belousov-Zhabotinsky reaction (Russians, 1950s)

Scale of pattern is large compared with molecular scale


**A**





**B**



**C**



**Benard cells (1900)**

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### Complex systems – key attributes

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### Complex system

- A complex system is one where 'things' are interconnected by non-linear forces and is open to the environment
  - Even with 'things' of the same class, they do not have to be identical
  - And 'things' can evolve and change with time, as can the forces between them
- We can include dispersed 'things' as well as discrete things – eg temperature, pollution, emotion
- This is a very general definition of a system

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## Appendix. Slides used for teaching as discussed in Chapter 7

### Attributes of complex systems – derived from mathematical modelling and some physics experiments

1. Behaviour is systemic – ie inter-related –ie non-linear
2. Diversity, micro-practice, non-linear terms, history, chance, choice all play their part in co-creating the future
3. This self-organising process shapes what structure/pattern emerges
4. There is no one set future – what emerges depends on what has happened before, and, at a 'tipping point', chance, ultimately, may play a part in tipping things in this direction or that
5. At tipping points, new qualities may emerge which could not be described or predicted from the past (unknown unknowns)
6. Note: we talk about systems as if they were 'things' but systems interconnect, are nested, shift boundaries. What is environment and what is the issue of interest must be constantly questioned, be subject to scrutiny
7. *The beguiling thing is that when a system has stabilised, it can be approximately described by linear terms – however this does not help us understand how stable it is or how it might change*

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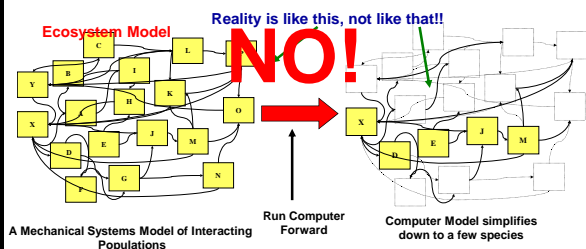
### The dangers of looking at things mechanically (point 7)

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### Can Ecosystems be modelled by mechanical, systems equations? An example from Chesapeake Bay

- If run, the "model" ecosystem collapses. It does not adapt and evolve! **Reality does!**



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### Diversity, chance, path dependency – the story of the frogs in Bath pond

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### Dynamics and statistics and path dependency – from a maths point of view

- Newton's focus was on dynamical systems of small numbers of discrete things
- Thermodynamics and statistics look at systems where there are so many things you track them via average qualities and treat them like liquids – **and** assume the most likely thing will happen
- Both are deterministic and both assume no memory/path dependency
- When do you use one approach, when the other – or are neither appropriate?
- Prigogine, Allen and others used a different sort of maths which looked at actual interactions but tracked all possibilities at the same time (Chapman-Kolmogorov equations)
- This showed that there was often more than one possible end point (stationary state)
- For example, if you take a pond in which one species is prey and the other predator, and both are dying and being born – depending on the details of what happened, the system may settle in this state or in that state: eg if lots of births happen early in the prey, the predator may not be able to eat them all so they get established; if more get eaten earlier then the prey may die out
- If you considered the pond via average birth and death rates and average numbers eaten, the possibility of two end states would not be found – you'd get an average answer
- This shows the importance of path dependency, of micro-processes, of the 'minute particulars' – and shows how niches emerge (and need non-average behaviour **and** non-linear)

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### A deeper look: state space, self-organisation etc

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## Appendix. Slides used for teaching as discussed in Chapter 7

State space – understanding things from a different perspective (note this is not in particular a complexity concept: it is used widely in maths and physics)

- The collection of all possible states in which a system can exist
  - eg a frequency spectrum
- Describing something in terms of what states it is in conveys the same information as describing it in space and time
- A pendulum is an example of a point attractor
- A system of two coupled pendulums is an example of a cyclic attractor
- An attractor basin is a region of state space, where, if the system settles there, tends to stay there

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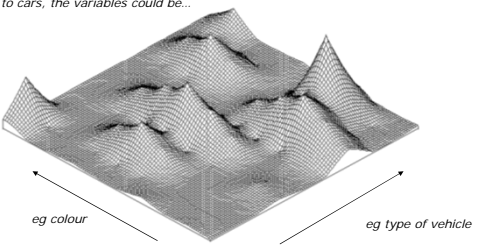
The state space of cars



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State space – two dimensional representation and amplitude of states

The collection of all possible states in which a system can exist  
If applied to cars, the variables could be...



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Self organisation of a market place

- For a system operating in a stable environment, certain processes and characteristics mutually reinforce and others die, ultimately resulting in patterns of characteristics which are dynamically stable
- What patterns emerge is a function of history, timing, fluctuations
- This results in certain niches existing; the niches are attractor basins in state space
- This is an example of the car market having self-organised; it defines the strategy space for the car market – suggests what strategies will work and what will not
- So what about a new car manufacturer? It's strategies initially will shaped by the structure of the market – ie it might do better to adopt an existing successful strategy. BUT suppose it adopts a new approach? Or suppose all manufacturers decide to populate the same niche? These behaviours might result in re-shaping the market. As a result, old characteristics die away and others come to the fore. The internet, text-messaging were new approaches which re-shaped the communications market

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The Complexity Matrix – a view of the relevant strategies given the characteristics of the environment and our knowledge of it

degree of knowledge – of environment and internal resources	unknown	<p>uncover;</p> <p>extend, search for new niches</p>	<p>go wild;</p> <p>experiment; see what happens; adapt and learn</p>
	known	<p>exploit;</p>	<p>flex</p> <p>fashion substitution</p>
		stable	unstable

degree of stability – in environment

J G Boulton 2002

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Self-regulation, self-organisation and global change

- When the system is in a (dynamically) stable place (in a valley in state space – ie in an attractor basin) it is able to **self-regulate** if things change (a little) in its environment or in its internal structure. Gaia theory belongs here. Bath pond changes a bit in number of animals and in who eats whom but basically fluctuates about a norm
- When the system is near a tipping point, near the separatrix between two (or more) valleys, it may not take much to **tip** the system into a new form. This is **self-organisation**. This new form may or may not be beneficial! – and where it tips (ie which valley) is hard to control or predict. (eg If Bert Frog insists everyone eats mosquitoes and the weather gets colder, Bath pond may tip into having no frogs; when the weather warms up there may be a huge amount of mosquitoes and the frogs may or may not re-establish)
- Just to make things even more complicated - because the system is not independent of its environment but *coevolves* with it, the landscape of the state space may itself change/self organise as you move about on it! If Bath pond tended to provide most of the frogs in the area, or if other ponds were equally affected by the sudden cold, frogs may die out altogether and pave the way for the dominance of escaped pet vipers
- The ability to self-regulate and/or to move smoothly into a new form (**self-organisation**) is enhanced by interconnectivity and diversity. By having lots of species, frogs with independent natures trying out different foods, cooperation between robins (who uncover beetles) and frogs (who eat them) etc

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## Appendix. Slides used for teaching as discussed in Chapter 7

### Walking across Greenland story

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### Summaries

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### Tipping point

- The tipping point describes the point of no return at which new factors will take precedence over existing factors. The factors that were in balance are no longer in balance and other factors not noticed or thought unimportant will start to dominate (eg rats when dinosaurs died)
- Although we focus on the **point** of tipping, in fact things have been changing way before then. These changes have wobbled the system to the edges of its self-regulated attractor basin and it is poised to change; how it changes is a function of what has happened to date and what happens at the point of no return (eg fall of the Berlin Wall story, end of apartheid)
- So it is both true to say that small things can have big effects and also that creating 'good ingredients' in the system and acting to maintain connections, 'slack', diversity helps to shape the future even if there is little to show. Also short linkages between causes and effects helps (as not done with current financial systems)
- At this point of no return, we may see runaway behaviour and, equally, we may see a smooth shift into something else
- At this point of no return, there is more than one possible outcome (despite the sense of retrospective coherence)

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### Self organisation – from a complexity perspective

- Self organisation is the process, over time, by which certain relationships strengthen and dominate whilst others weaken; it shapes and defines the patterns that emerge (eg story of trek across Greenland)
- Self organising always happens – despite top down behaviour (eg resistance movement in Holland); there are always unintended consequences
- The process is synergistic, non-linear; when (dynamic) stability is reached, it is easy to imagine that small factors are unimportant, that relationships will hold. Standardisation, too great a focus on efficiency, breaking the potential for new relationships will reduce the ability to adapt to changing circumstances
- The outcomes of self-organisation is not necessarily good (Nazi Germany, Lord of the Flies) - and it is not a recipe for no leadership or challenge (example of innovation firm)
- The concept relates both to changes of an organisation within an environment (pond, trek) and to changes to the environment itself (car market)

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### Emergence – from a complexity perspective

- Emergent properties cannot be understood in terms of the properties of their constituent parts
- In addition, if the same dynamics were repeated, the same properties would not necessarily emerge (eg the dinosaurs' death could have led to moles being in the ascendant not rats)
- The new properties are qualitatively different than before and could not have been predicted (eg understanding today's children from a pre-texting perspective)
- Emergence happens at tipping points via self-organisation – and may be triggered by internal factors (new leader, new innovation), external factors (new entrant into the market place, climate change, twin towers, the last straw in people's frustration)

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### Conclusion

- Complexity theory gives a worldview which is closer to our experience than a mechanical worldview
- It shows the dangers of adopting a mechanical worldview (assuming certainty when you cannot, reducing diversity, overly controlling)
- It emphasises the importance of maintaining diversity and the potential for interconnectivity and understanding that the future is a complex mix of influences including history, context, chance and choice
- It emphasises the importance of small things – both in creating 'good' ingredients and in sometimes catalysing radical change
- It emphasises both humility (we cannot control everything) and hope (we cannot know what will happen at tipping points) and responsibility (Mandela in his cell, good ingredients)
- It emphasises looking for and nurturing new shoots or supporting mature ecologies that work well (rather than starting from scratch, clean sweep, one size fits all); scanning the future, looking for signs of change, thinking systemically

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